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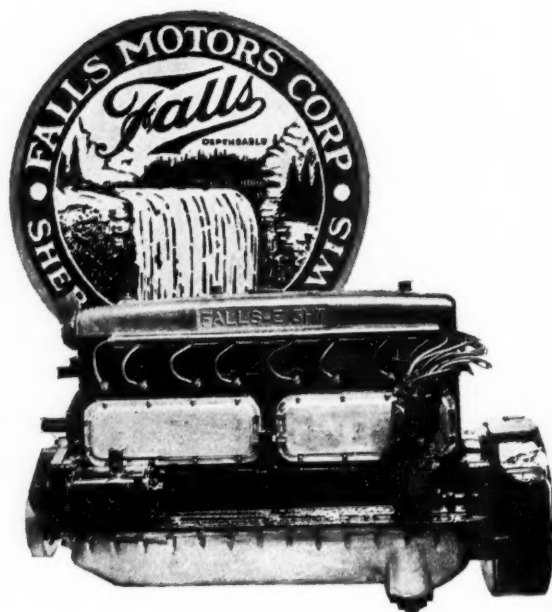
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Lined Bearings
Die Cast Babbitt
Bearings and Bushings
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The new Falls Eight main bearings are Federal-Moguls. Connecting rods are lined with Mogul Alloy Genuine Babbitt.



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AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

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NEW YORK—THURSDAY, JULY 31, 1924

No. 5

Parts Makers See Better Business in Last Half of 1924

Low profits and high overhead chief troubles. Keen competition
and excess plant capacity blamed for difficulties.

Value of stable supply sources increases.

By Norman G. Shidle

PARTS makers are going into the second half of 1924 with confidence. Most of them look for better business before the end of the year but are planning their operations on a very conservative basis. Every executive in the parts industry does not view the situation this way, but a good majority of them do. There are pessimists scattered here and there who consider the present situation bad and expect it to get worse. They base their opinion chiefly on the theory that their shipments in July haven't been as big as in May and June and that car manufacturers are operating on schedules which will be governed almost entirely by the trend of retail sales.

Predictions about the last half of the year seem to depend a good bit on the state of mind of the man making them. Two persons may look at the same picture and one see in it a perfect masterpiece while the other considers it a meaningless daub. The present situation in the parts industry is subject to just such dissimilar views. The facts are that business is slack in nearly all of the equipment plants and that competition is so keen in certain parts of the field that even increased orders do not seem likely to result in greater profits. A good many parts makers, on the other hand, are finding it possible to make money even with curtailed production schedules and expect to return a fair profit for the year provided business picks up to any extent in the next few months.

Some parts executives are inclined to blame the vehicle builders for many of their troubles. These

men feel that the car and truck manufacturers have taken advantage of the keen competition existing in the parts field to beat down prices to a point at which reasonable profits are impossible. Others who recognize the existence of this condition just as clearly think that the parts makers themselves must assume a major part of the blame because they have been so eager to get business that they have taken it at non-profit-yielding prices.

NO one really expects the car and truck builders to pay any more than they have to for parts. Such procedure would be unnatural, so long as quality were about the same in each of the products offered. But some executives of an analytical turn of mind see the question as involving more than immediate prices. One of them summarized the situation the other day, for example, something like this:

"The vehicle manufacturer has to look further than the immediate order if he is going to do his buying on a really economical basis. He may be able to get a lot of parts at ridiculously low prices from some parts maker who is hard up for business. But, unless the parts maker is getting a reasonable profit, it is only a question of time until he goes out of business. Then the car manufacturer has to look around for another source of supply.

"It may be said that there always will be another sucker ready to take the bait. But I don't believe it. The time is coming when capital will not be

available for such enterprises as readily as it has been in the past.

"Even if the car manufacturer can turn to someone else who is glad to get the business at a profitless price, he simply is running up the basic economic cost of doing business in the industry—a cost which eventually his company, along with others, will have to pay.

Stable Supply Sources Needed

"The value of stable sources of supply has not been recognized sufficiently in the past. The confidence, the smoothness of operation of details, the low overhead on die costs and many other items enter into the question of buying economy to a very large extent. A car manufacturer can save money over a period of years by placing his business at a price which will yield profit to the parts maker and by thus establishing for himself a continuous, reliable source of supply."

More than one passenger car manufacturer already has recognized this fact. One prominent parts maker bears witness to the fact that his best customers almost invariably ask, just before a contract is signed, "Will you be able to make a profit out of this business? We want you to make money because that is the only way we can be sure of the stable, high-quality service which we have to have."

Other car companies have a less favorable reputation among parts makers. Those vehicle builders who consistently demand their pound of flesh are pretty generally known throughout the parts field and have few real friends among the producers who supply them with original equipment units. If there ever comes a time when the car manufacturers need consideration or special aid from the parts makers, some companies will be accorded a much more favorable hearing than will others.

One parts executive, discussing the current situation, recently took a view somewhat different from many of his fellow workers who blame low prices for most of their troubles. This particular executive runs a plant which is making money at the present time and which holds contracts with important car makers which call for prices several dollars higher than those offered by competitors for the business. When asked how his company had accomplished the feat of holding these accounts and of making profits through times of depression, this executive said:

"The first essential for the parts maker is to set his own house in order. I know it's the common thing to say these days that further production advances are difficult and that future economies will have to come from outside the factory.

"That's true only to a limited extent. Overhead expense still is very high in a good many factories. Excess buildings and machinery are eating up the profits in more than one parts plant today. This often is due to excess enthusiasm on the part of some people when business begins to get fairly good.

"Our plan always is to figure on operating our plant about ten full months out of the year. We figure on a

conservative basis and try to do our expanding and contracting within the walls, rather than by expanding the physical capacity of the plant and piling up investment in bricks and mortar.

"The place to get profits is out of your own factory. Usually it can be done.

"We keep down our supervisory force to the smallest possible number. Everybody works. We don't have a lot of people sitting around watching somebody else do something. No executive in the company is so high-powered that he can't take off his coat and do a real job every day.

"It's hard to say just how we have obtained and held the profitable business which we have. One reason is that the low overhead with which we operate makes it possible for us, without material loss to ourselves, to take care of a customer whose quantity fluctuates considerably. We have our plant lined up so that it can turn out a good production on short notice, but we can permit our customers to hold up orders without trying to force commitments on them because our manufacturing facilities are rigid.

Our equipment is designed and set up to provide the greatest possible flexibility. Quality—proved by service—is another of our sales arguments, while the element of personal friendship has entered into making sales to a considerable extent.

"Don't get me wrong on this 'personal friendship' idea," this executive continued. "I'm not talking about signing million dollar contracts at the 19th hole of the Squeedunk Golf Club or any of the rest of the usual stuff

you read about. What I do mean is that the personal contact of our executives with many men throughout the industry over a long period of years has resulted in establishing bonds of mutual confidence and good-will which have a very practical meaning and value for both buyer and seller in any business transaction."

Generalities are dangerous in speaking of the present situation in the parts field. While the entire industry has been affected by the general business depression, the condition of various companies today differs in accordance with their position at the beginning of the year, their plant capacity as related to profitable production possibilities and other factors. One company, for example, may have been forced to add machine equipment to its plant at the present time because of orders placed when business was booming. Such equipment simply becomes an added burden at present. Another factory may be equipped with numerous special machines which makes difficult readjustment of its production.

Future Prospects Good

Every sign points toward better automotive business in the next five months. While some reports coming in from various parts of the country seem a bit too optimistic, there can be no doubt that conditions are improving in practically every section and that this retail advance will be reflected in manufacturing programs—first of the vehicle builders and then of the parts makers—in the near future.

Profits on Parts

"THE parts maker must get his profits out of his own plant," said an important parts executive the other day.

"The price received for a product is determined largely by competition and economic conditions. The cost of making it rests on the individual manufacturer.

"Keep the overhead down; don't get too much investment in brick and mortar.

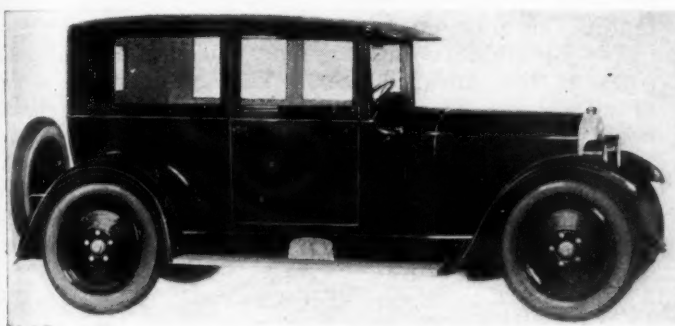
"Keep tool equipment as flexible as possible.

"Dig the profits out of your own factory."

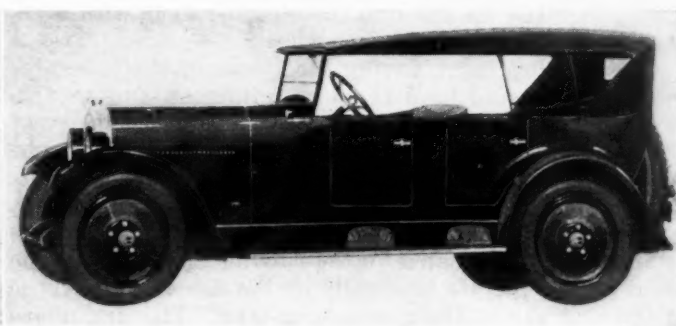
Nash Adds Smaller Six and Drops Four Cylinder Models

Both sixes now have four wheel brakes and balloon tires on disk wheels as standard equipment. Steering gear redesigned with larger ratio. Prices of continued model up.

By Donald Blanchard



Special Six sedan of the new Nash line of sixes which has a wheelbase of 112 inches



Phaeton on the Special Six chassis which replaces four-cylinder models

TWO new lines of passenger cars, designated as the Special Six and the Advanced Six series, have been brought out by the Nash Motors Co. The Special Six series, which is completely new, has a 112-in. wheelbase chassis with a $3\frac{1}{8} \times 4\frac{1}{2}$ -in. overhead valve engine. The Advanced Six series is a continuation of the previous six-cylinder line in 121 and 127 wheelbase lengths, with new body lines, full pressure engine lubrication, and the addition of mechanically operated four-wheel brakes and balloon tires, which latter are also regular equipment on the Special Six. The cylinder dimensions of its engine are $3\frac{1}{4} \times 5$ in. and its piston displacement is 248.8 cu. in. as compared with 207 cu. in. for the Special Six. The four-cylinder line has been discontinued.

A five-passenger phaeton and a five-passenger, two-door sedan listing at \$1,095 and \$1,295 respectively, make up the Special Six line. The Advanced series includes five- and seven-passenger phaetons and sedans, a roadster and a four-door coupe, the price range being from \$1,375 to \$2,290, which is an increase of \$100 over the range on the former six-cylinder line.

The Special Six chassis follows the general design of the Advanced Six and the latter does not differ greatly from the six-cylinder model which it displaces, except in the front axle and steering layout where radical changes have been made to meet the new conditions imposed by balloon tires and front wheel brakes.

The new front axle design, which is also used on the Special Six, is a reverse Elliott type of I-beam section for the major portion of its length. At its ends, however, it is given an oval section to enable it better to resist the torsional braking strains. The king pin, which is fixed in the axle, is vertical when viewed from the front, but is inclined slightly backward when viewed from the side to give $1\frac{1}{2}$ deg. of caster. Special Budd-Michelin disk wheels with offset hubs are used on all

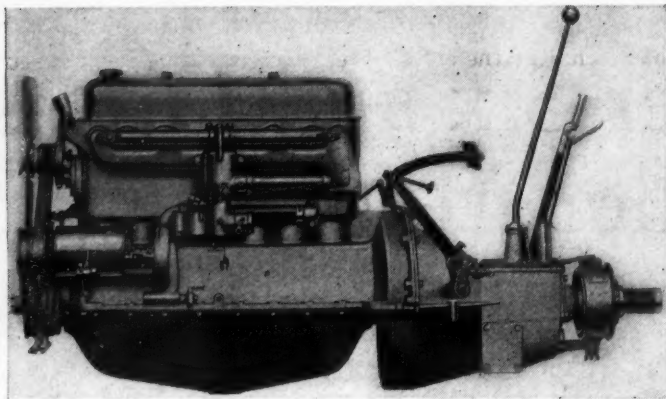
models and these permit setting the ends of the axle into them so that the distance between the center line of the king pin and the center plane of the wheel, measured along the axis of the stub axle, is reduced to about $1\frac{1}{2}$ in.

The wheels have a slight camber, which brings the center of tire contact to within about $\frac{7}{8}$ in. of the axis of the king pin. In this way approximately center point steering is obtained and the load transmitted from the knuckle to the axle is limited almost entirely to the vertical. Consequently the radial friction on the steering knuckle bushings is so greatly reduced that easy steering is obtained without the use of anti-friction bearings at these points. The small radius of rotation of the center of tire contact around the axis of the king pin is, of course, another factor making for easy steering.

Worm and Sector Steering Gear

The steering gear is a Gemmer worm and sector type with a reduction of $11\frac{1}{2}$ to 1 as compared with the $8\frac{1}{2}$ to 1 reduction provided by the worm and wheel gear used on the former six-cylinder chassis. The Special Six also has a steering gear of this type. An eccentric bushing adjustment is provided to take up wear.

To reduce the magnitude of road shocks transmitted back through the gear to the steering wheel, the steering gear connecting rod is installed so that its axis passes through a point about $1\frac{1}{2}$ in. below the front spring eye. This layout is said to give correct geometrical conditions when the front spring is under compression, the error being taken entirely during the rebound. The pressure—and consequently the friction—between the tires and the road is maximum when the front springs are compressed. If at this time there is a geometrical error in the steering layout, the large frictional resistance at the tire contact will tend to prevent compensa-



Showing the right side of the Special Six engine

tion of the error by a swing of the wheels about their pivots. Consequently, under these conditions, the error would be taken up through the steering gear with a resultant shock at the steering wheel.

On the other hand, during the rebound, the pressures between tires and road are at a minimum, and so also is the friction. As a result, an error in the geometry of the steering layout will, at least in a large measure, be compensated for by a swing of the wheels about their pivots instead of causing a shock at the steering wheel.

The four-wheel braking system on the larger chassis is practically duplicated on the smaller Special Six. The front brakes operate internally on the drums while those at the rear are of the contracting type. The drums are riveted to flanges on the hubs, and on the Advanced Six they are 16 x 2 in. in front and 16 x 2½ in. in the rear. All four drums on the Special Six are 13 in. in diameter by 2 in. wide. As on the previous six-cylinder chassis, the emergency brake is an external contracting, shoe type acting on a drum mounted on an extension of the transmission shaft. On the smaller car the drum size is 6½ in. in diameter by 2 in. in width, the corresponding dimensions on the larger six being 7½ and 3½ in.

Details of Front Wheel Brakes

The internal brakes on the front wheels have two die-cast, aluminum shoes. After the lining is riveted to them, the shoes are mounted in a fixture on centers and ground. One end of one shoe is anchored to the brake cover and its opposite end is joined to the second shoe by a hinge construction. The other end of the second shoe is flat and it is against this surface that the brake operating lever acts.

Two spiral release springs are provided to hold the shoes from contact with the drum, movement of the shoes being further controlled by guides and adjustable stops. Adjustment is secured by moving the anchor pin. This pin is integral with a small plate which is secured to the brake cover by two bolts. The heads of these bolts hold a second plate tightly against the outside of the brake cover. The contact surface of this plate is made with serrations to prevent its slipping. To adjust the brakes, it is simply necessary to loosen these two bolts and tap the serrated plate in one direction or the other until the desired result is obtained.

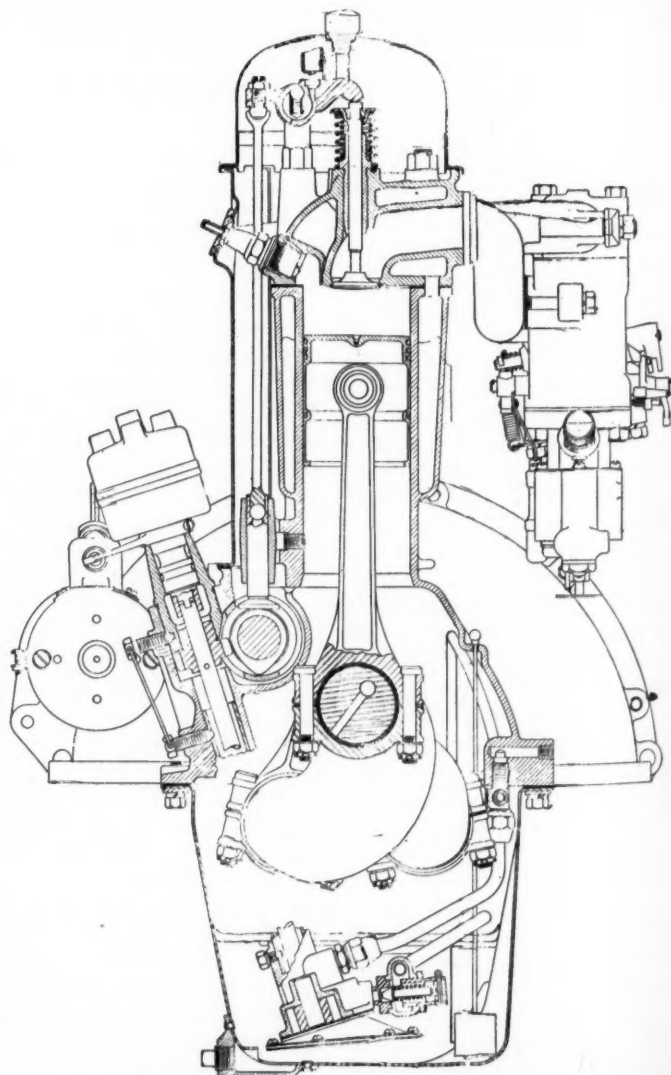
The brake operating lever is mounted on an inclined pin which is clamped to an extension at the top of the king pin. The center of the ball on the upper end of this lever lies in the prolonged axis of the king pin. The opposite end of this lever also has a ball to which the brake rod attaches.

The brake linkages are laid out to divide the pressures on a 40-60 basis, between front and rear wheels obtained

by increasing the leverages on the rear brakes, and by making the release spring on the front brakes stronger than those on the rear.

To give equal braking on opposite wheels, the brake pedal is connected through an adjustable link to an equalizer bar which operates short levers secured to a cross shaft. This shaft is in two pieces which are connected by a ball joint, at which point the shaft is hung from the bell housing. This construction provides right and left equalization. The outer ends of the cross shaft are supported by rocking members which hang from brackets bolted to the outside of the frame side rails. They are also supported by helical springs attached to brackets on the inside of the side rails. This construction in conjunction with the ball joint between the two parts of the shaft permits fore and aft motion of the shaft ends as well as some lateral movement. On each end of the cross shaft there is an S lever to which the brake rods attach. These rods extend to short levers pivoted on brackets on the side rails. From these levers, rods extend to the brake operating levers.

The Special Six engine is designed along the same lines as the Advanced Six. The cylinder block and crankcase are an integral iron casting. The cylinder head is detachable and a pressed steel cover is provided for the overhead valves. The crankshaft is carried in three bronze-backed, babbitt bearings, 2¼ in. in diameter and of the following lengths: Front, 2½ in.; center, 2⅜ in.; rear, 2⅝ in. The connecting rods are drop



Transverse section of Special Six engine

forgings of I-beam section with $2\frac{1}{4} \times 1\frac{7}{8}$ in. babbitt bearings in their big ends. The pistons are a light weight cast iron design with four rings and have the pins, which are $\frac{7}{8}$ in. in diameter, secured in them with set screws.

The crankshaft in the Advanced Six now has integrally forged counter weights. Its diameter has been increased from $2\frac{1}{4}$ to $2\frac{3}{8}$ in. The main bearing lengths are, $2\frac{3}{4}$, $2\frac{3}{4}$ and $3\frac{1}{4}$ in., from front to rear, respectively.

Helical gears are used in the front end drive. The camshaft is located in the right side of the crankcase and operates the valves through mushroom tappets and the conventional pushrods and rocker arms. The pushrod has a cup end into which fits the ball end of a screw threaded into the rocker arm. This crew is provided with a lock nut. This construction is also used on the Advanced Six engine, which formerly had the ball and adjusting nuts on the end of the pushrod. Adjustment with this design is simple, as only a screwdriver and an end wrench are required. The rocker arms are held against endwise motion by springs and balls which fit in holes drilled in the rocker shaft, the balls registering with depressions in the rocker arms.

The oil pump is driven from spiral gears at the center of the camshaft which also drive the distributor. It supplies oil under pressure to a header which conducts the lubricant to the three main bearings from which point it passes through the drilled crankshaft to the connecting rod bearings. The overhead valve mechanism is lubricated

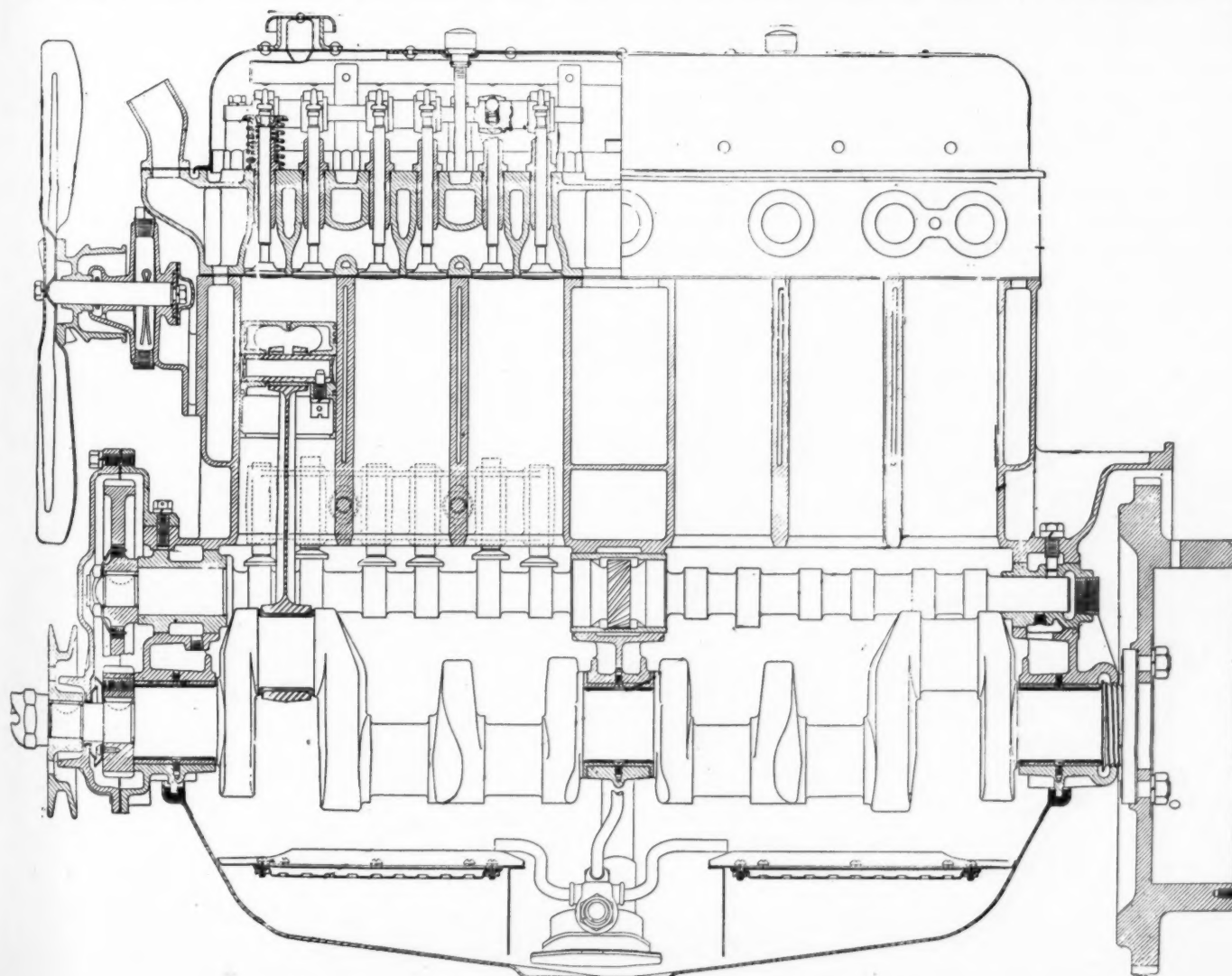
from a reservoir just above the rockershaft. The oil filler tube is at the top of the engine and is arranged so that each time the oil is replenished, the reservoir is filled.

Rocker Arm Bearing Lubrication

On the top of each rocker arm, a hole is drilled which is directly below a small opening in the bottom of the reservoir. Oil dripping out of the reservoir, is caught in these holes which act as cups from which point the lubricant is conducted to the rocker arm bearings by wicks. Pressure lubrication is also provided for main, connecting rod and camshaft bearings in the advanced engine which is a change from last year when oil was supplied under pressure only to the main bearings. In this engine, however, the hollow rockershaft acts as a reservoir. The oil is supplied to it through a tube from the pump.

The oil in the reservoir passes through holes drilled in the rockershaft which register with circular grooves in the rocker arm bearings. In the lower halves of these grooves are wicks, the ends of which pass through holes drilled in the rocker and extend out to the ball on the rocker on one side and to the valve spring retainer on the other. Excess oil is caught in a pan resting on the cylinder head and drained into the crankcase through the pushrod chamber.

The oil in the reservoir passes through holes drilled in the rockershaft, which register with circular grooves cut in the rocker arm bearings. In the lower halves of these grooves are wicks, the ends of which pass through



Longitudinal elevation partly in section of the Nash Special Six $3\frac{1}{2} \times 5$ in. engine

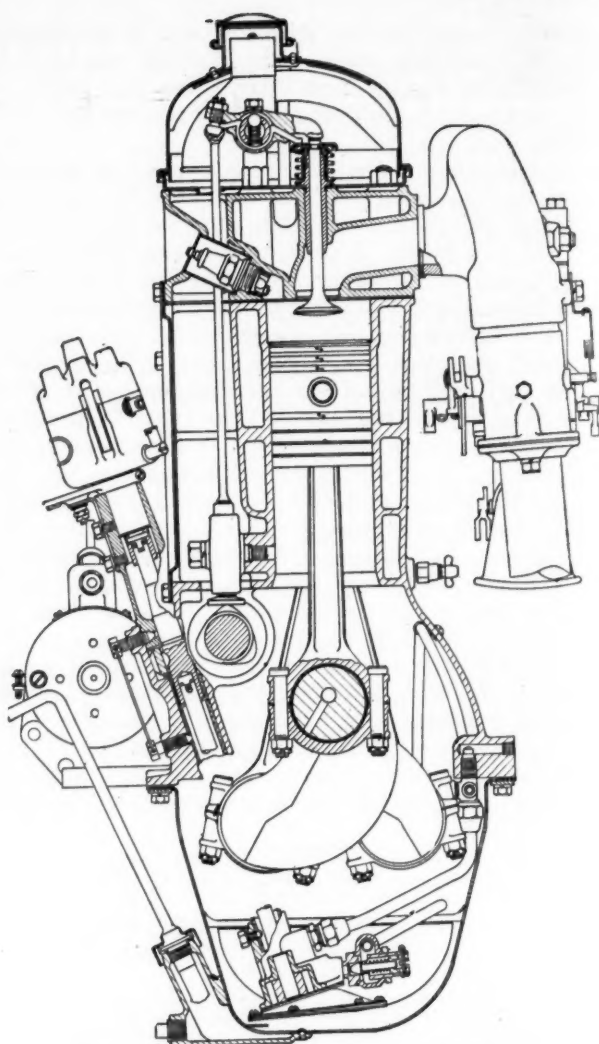
holes drilled in the rocker and extend out to the ball on the rocker on one side and to the valve spring retainer on the other. In this way lubrication is provided for all parts of the valve mechanism. Excess oil is caught in a pan resting on the cylinder head and drained into the crankcase through the pushrod chamber. This oiling system is also used on the Advanced Six, which is a change from the previous model, in which only the main bearings were pressure-lubricated. In this engine, however, the rockershaft reservoir is supplied directly from the oil pump by means of a tube.

Cooling water is circulated by a centrifugal pump, but the construction at this point is entirely different from that employed in the Advanced Six. In the latter engine, the pump is driven by an extension of the camshaft, and the generator, which is mounted on the front end of the engine, is driven by the fan belt. In the Special Six the generator is carried by a bracket on the left side of the crankcase at the front. On the forward end of its shaft there are two pulleys. One of these pulleys is driven by a flat belt from a pulley on the end of the crankshaft, and the other drives the fan through a second belt. The pump is supported on a bracket on the back of the generator and is driven from the rear end of its shaft.

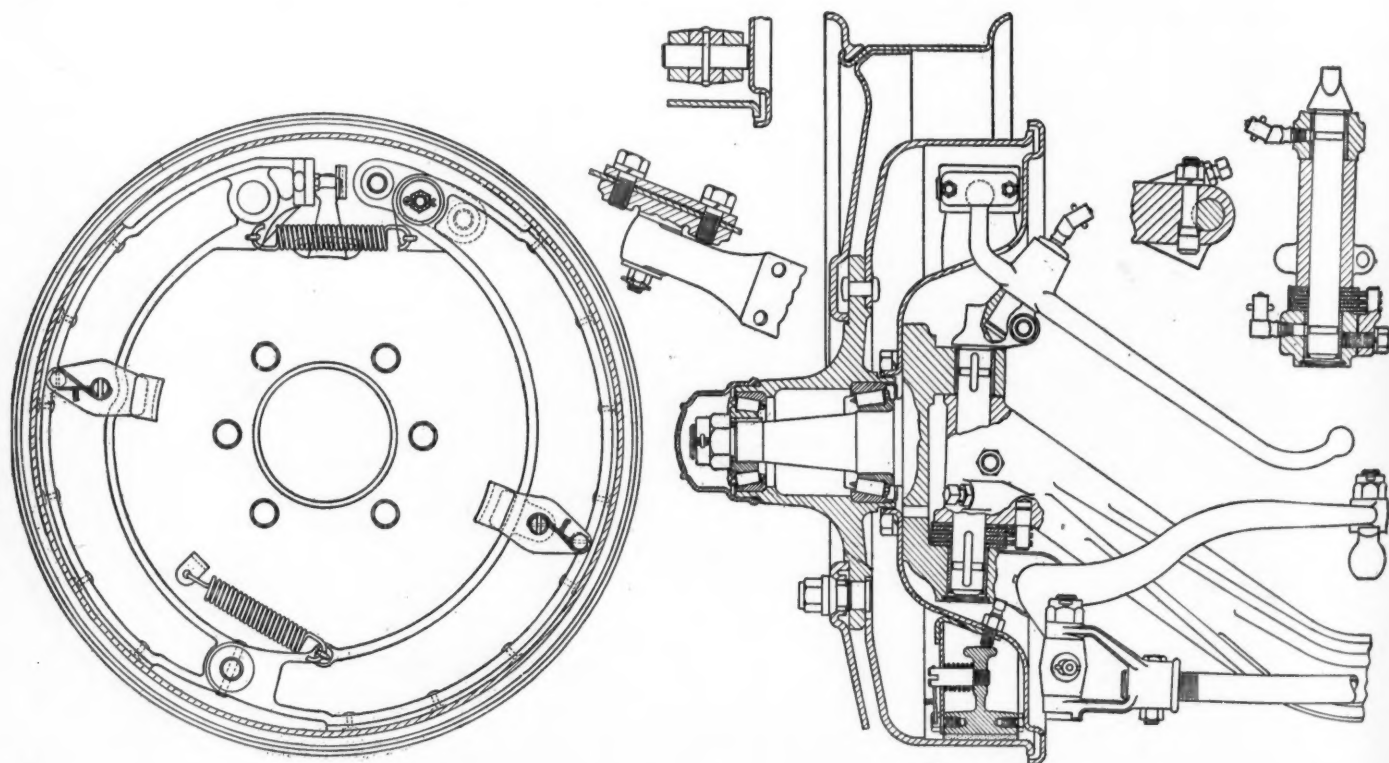
Fuel System

The fuel system includes a Stewart vacuum tank, which feeds gasoline from the 15-gal. tank at the rear of the chassis, and an automatic float feed carburetor. The riser leading from the carburetor to the manifold is provided with an exhaust heat jacket. A damper valve in the exhaust manifold controls the proportions of the hot gases entering this jacket. This valve is interconnected with the throttle and is also provided with a dash control so that it may be easily adjusted for climatic conditions. This heating arrangement is also used on the Advanced Six in which, contrary to the practice of last year, no heat is applied to the carburetor.

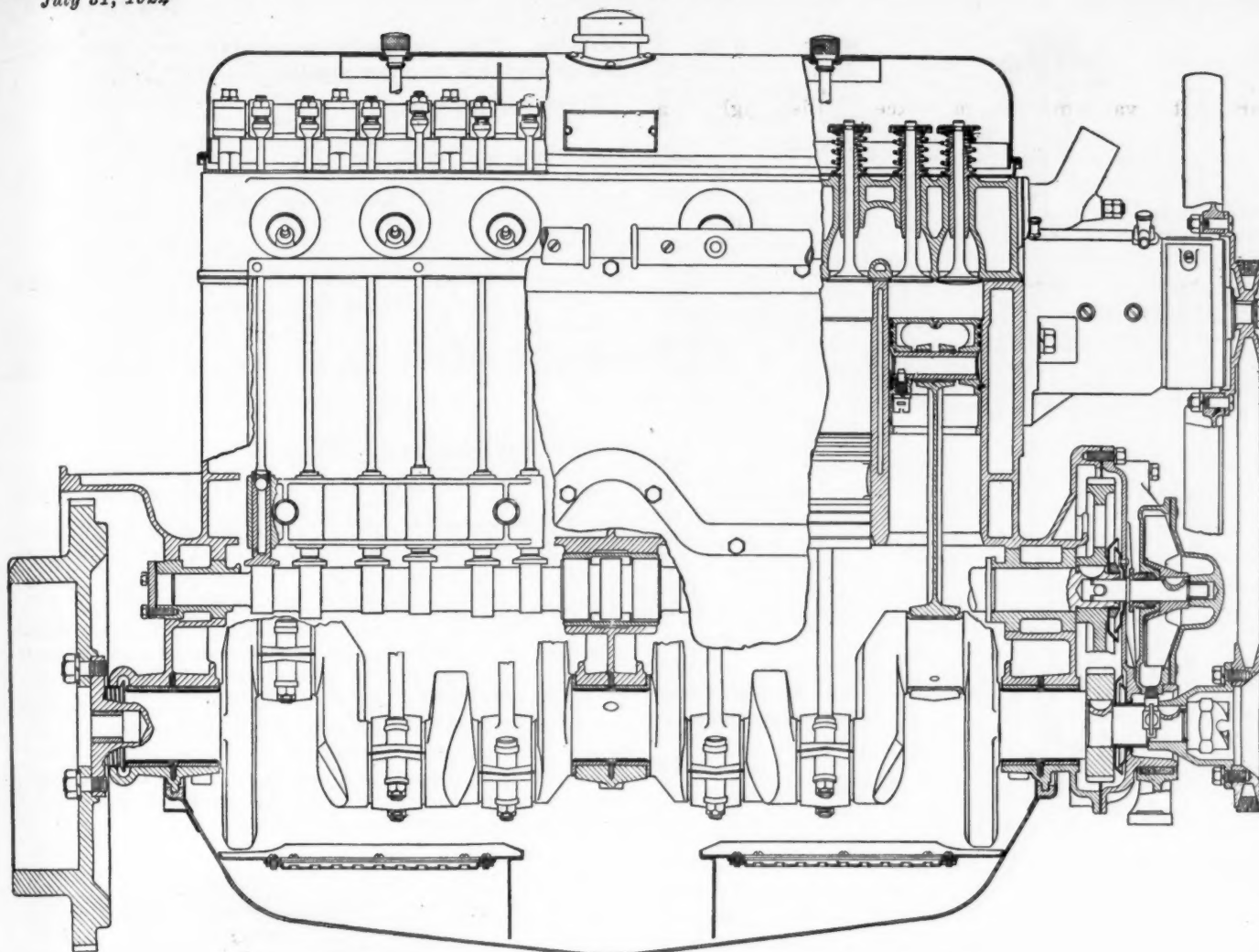
Starting motor, generator and distributor are of Delco make. The electrical system is a single wire type oper-



Transverse section of "Advanced Six" engine



Assembly views of the front axle, steering knuckle, front wheel and brake which is a Servo type



Side elevation, partly in section, of "Advance Six" Nash engine

ating at six volts. All high tension cables are inclosed in a protecting housing on the side of the pushrod chamber cover.

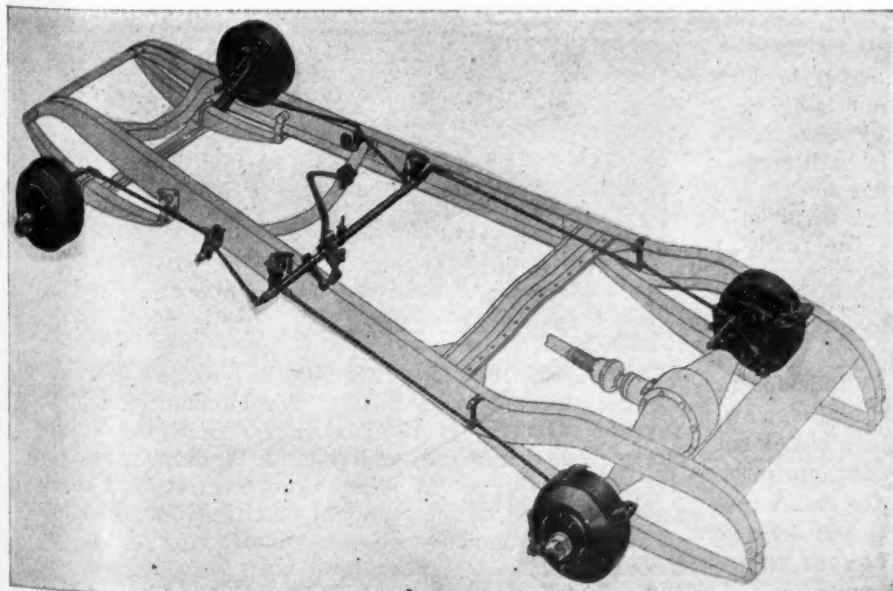
The single plate clutch and the three-speed transmission are mounted as a unit with the engine, the whole being suspended at three points and rubber-insulated from the frame. The front end support is a trunnion

while the two rear supports are formed by arms cast integral with the crankcase. The clutch of the Advanced chassis differs from that previously used in that the friction material is riveted to the driven disk to prevent it from being warped by heat.

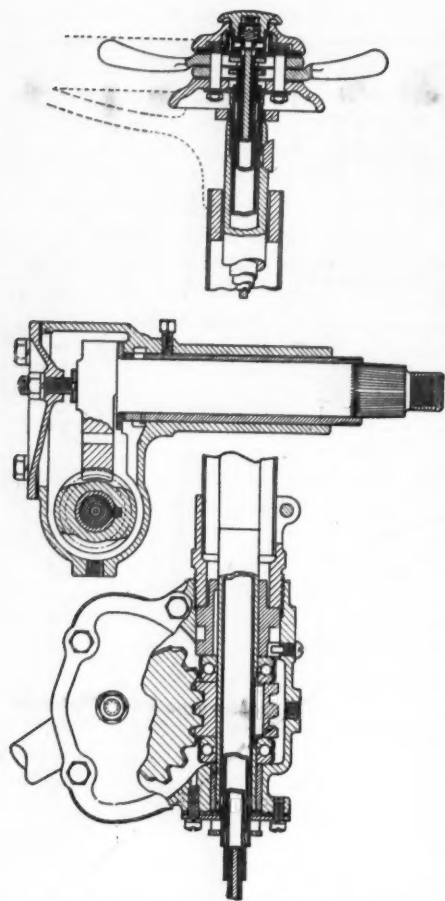
Power is transmitted to the rear axle through a splined, tubular propeller shaft with metallic universal joints at

both ends. The driving thrust and rear axle torque are taken through the springs. The rear axle is a semi-floating type with spiral bevel gears.

Frame side rails are of channel section and are braced by five cross members, three of which are tubular. The tubular member at the front rear spring hanger is of the built-up type used on previous Nash models. The springs are semi-elliptic front and rear and are provided with rebound plates. They are $37\frac{1}{8} \times 2$ and $53\frac{7}{8} \times 2$ in. in dimensions, respectively. The rear springs are underslung and the front ends of the front springs are supported at the sides of the frame channels, the construction at this point following that employed in the Nash Four. The tire size is 31 x 5.25 in. with ribbed treads on the front and combination treads on the rear. On the Advanced Six the tire size is 33 x 6 in. and a rim with a nominal



Layout of the brake system on Nash chassis



Details of steering gear used on new Nash chassis

width of 5 in. is used to prevent side sway. Another new feature on this car is the provision made for shortening the effective length of the rear spring when it is under compression. This is accomplished by means of a wooden wedge faced with brake lining, which is mounted on the under side of the frame side rail at the beginning of the kick up. When the spring is compressed its top surface bears against the wedge, so that its effective length is reduced and its stiffness correspondingly increased.

The new body lines on the Advanced Six are quite different from those of last year, and the general appearance of

Bodies Finished in Colors

The Special Six phaeton has a marine blue body with black top, fenders and aprons. The sedan body is a dark green gray with black upper body. It also has a metal trunk rack at the rear. Upholstery in both models is of leather. In the advanced line, the open models are upholstered in leather and the closed bodies in mohair. The phaetons are finished in cobalt blue, the roadster and coupe in a green gray, the five-passenger sedan in sky blue and the seven-passenger sedan in Nash blue. The seven-passenger bodies and the four-door coupe are mounted on the 127-in. wheelbase chassis.

Regular equipment in the Special series includes extra wheel, transmission lock, aluminum kick plates, cowl lamps, rear view mirror and automatic windshield cleaner; the sedan has silk window shades. In addition to the above the Advance series has a clock mounted in a panel with the speedometer. The four-door coupe has a trunk and nickel guard bars. This body, as well as the seven-passenger sedan, also has vanity case, smoking set, reading lamps, dome light, heater, arm rests and silk

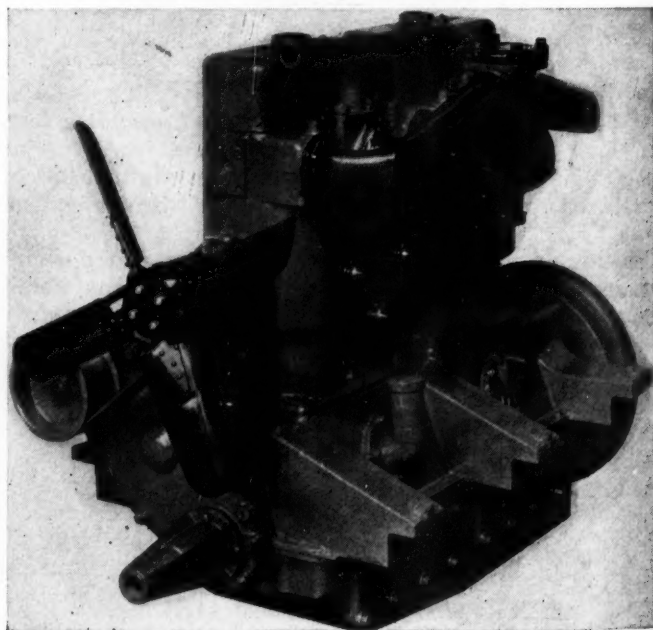
curtains. The five-passenger sedan has dome light, heater and silk window shades.

Prices scheduled are:

SPECIAL SIX SERIES	
5-passenger phaeton	\$1,095
5-passenger sedan	1,295
ADVANCED SIX SERIES	
121-in. Wheelbase	
5-passenger phaeton	\$1,375
5-passenger sedan	1,695
Roadster	1,375
127-in. Wheelbase	
7-passenger phaeton	1,525
7-passenger sedan	2,290
Four-door coupe	2,190

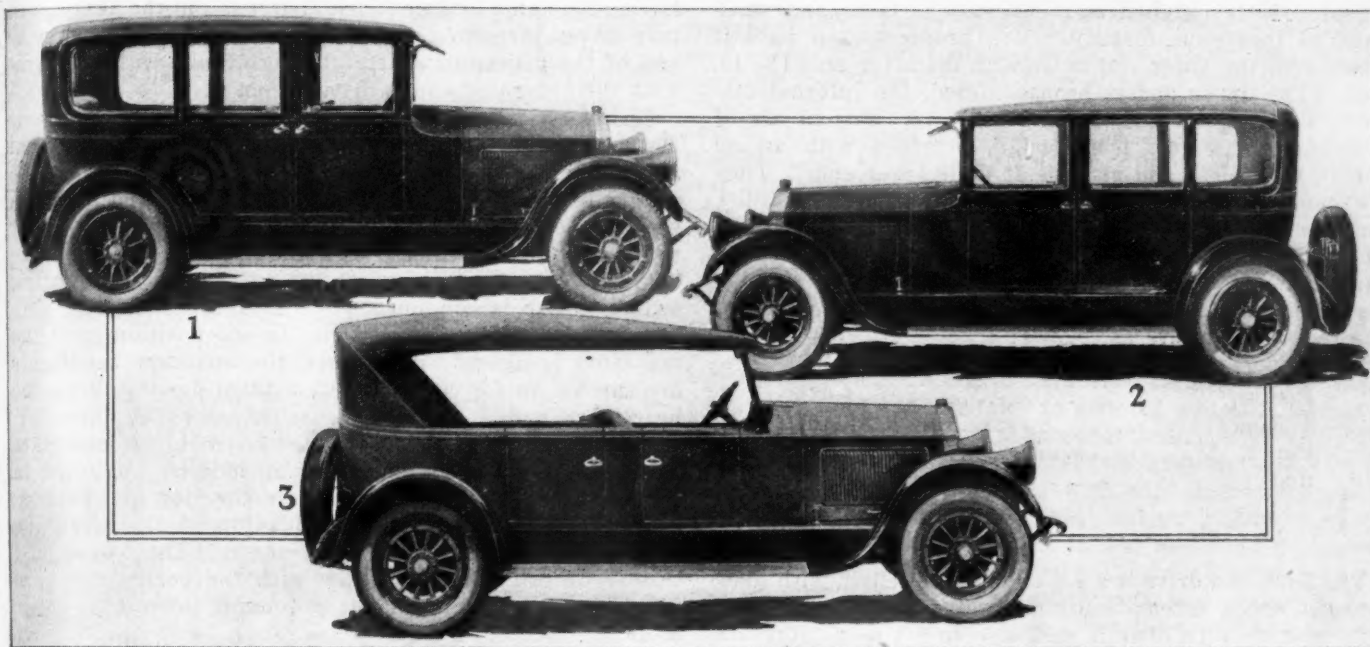
New Automobile Type Engine for Industrial Uses

WE reproduce herewith a photograph of a new heavy duty four-cylinder engine of a maximum output of nearly 100 hp. recently put in production by the Beaver Mfg. Co. of Milwaukee. The engine has a bore of 6 in. and a stroke of 7 in. (782 cu. in. displacement) and weighs 2000 lb. It is intended for use on cranes and crushers and as a powerplant for sand pits and stone quarries. The design is on the same lines as the firm's heavy duty engine for automotive service, only a trifle heavier. The torque curve shows a practically constant torque of about 480 lb.-ft. over the speed range of from 650 to 850 r.p.m., while at 1150 r.p.m., the speed of maximum output, the torque is equal to 425 lb.-ft.



Beaver type RB engine

TECHNOLOGIC PAPER NO. 257 of the Bureau of Standards deals with the "Development of a Method for Measurement of Internal Stress in Brass Tubing," the method being due to Robert J. Anderson, metallurgist of the Bureau of Mines, and Everett G. Fahlman, superintendent of the National Smelting Co. The internal stress referred to is due to the drawing of the tubes over an internal mandrel and was found to be longitudinal in direction, tensile in the outer fibres and compressive in the inner.



1—Seven-passenger sedan, \$3,995. 2—Five-passenger sedan, \$3,895. 3—Seven-passenger touring, \$2,895, which has a permanent top. Fender type headlamps are standard on all models

Pierce Arrow Announces Lighter Six with L-Head Engine

Piston displacement and weight are 30 per cent less than that of the larger model which is continued. Four-wheel brakes, balloon tires and torque bar are features.

By Donald Blanchard

WITH the introduction of its moderately priced Series 80 passenger cars the Pierce Arrow Motor Co. has entered an entirely new field. The line comprises seven styles and prices range from \$2,895 for the seven-passenger phaeton to \$4,045 for the inclosed drive limousine. All bodies are mounted on a standard 130-in. wheelbase chassis with a six-cylinder, $3\frac{1}{2} \times 5$ in. engine. Semi-balloon tires and mechanically operated four-wheel brakes are regular equipment on all models.

There are seven body styles, all of which closely resemble the corresponding models of the larger and more expensive Series 33 line which is continued without change. Comparing the new model with the earlier one, the piston displacement of its engine is 289 cu. in. as compared with 415. The wheelbase is 8 in. shorter, and the weight of the seven-passenger phaeton is 3640 lb. as compared with 5090.

The engine in the new car is an L-head design with combustion chambers domed over the valves and tapered to a minimum clearance on the opposite side of the cylinder to secure high turbulence of the mixture. Although its N. A. C. C. rating is only 29.4 hp., the engine actually develops 72 hp. at 3000 r.p.m. The compression space is 23 per cent of the total cylinder volume. The car handles well in high gear at low engine speeds and is said to be

capable of being accelerated from 10 to 40 m.p.h. in 14 seconds.

Both cylinder block and detachable head are gray iron castings. The crankcase, which extends $3\frac{3}{8}$ in. below the axis of the crankshaft for stiffness, is an aluminum casting with integral flywheel housing and supporting arms. The underpan is also an aluminum casting and is provided with longitudinal ribs on its under side to assist in cooling the oil and also to give it greater stiffness. The four-engine supporting arms rest on blocks or distance pieces riveted to the frame side rails. Two through bolts are provided at each arm. The mounting at the rear supports is rigid, while the front mountings are arranged to allow for frame distortion.

The crankshaft is carried in seven shimless, bronze-backed babbitt bearings, all of which are $2\frac{3}{8}$ in. in diameter. These bearings, in order from front to rear, have the following lengths: $2\frac{7}{16}$, $1\frac{1}{8}$, $1\frac{1}{8}$, $2\frac{1}{8}$, $1\frac{1}{8}$, $1\frac{1}{8}$ and $2\frac{5}{8}$ in., giving a total bearing length of $11\frac{11}{16}$ in. The crankshaft is a heat-treated forging of S. A. E. No. 1045 steel, machined all over and put in static and dynamic balance. The flywheel is also accurately balanced and has the starter ring gear shrunk on it.

Connecting rods are heat-treated, alloy steel forgings of I-beam section with bearing centers $10\frac{1}{2}$ in. apart. Each

set of rods is weighed and balanced on large and small ends to insure uniformity. The bronze-backed babbitt bearing in the lower end is 2 in. in diameter and 1½ in. long. The upper end is bronze-bushed, the internal diameter being 7/8 in. and the length 1½ in. Pistons are of a light weight, cast iron design, provided with an oil trough with holes and grooves at their lower ends. They are closely fitted in the cylinder and relieved to allow for expansion. All three rings are carried above the pin. The piston pins are made of No. 2315 steel, heat-treated, hardened and ground to size, and are secured in the pistons by snap rings. The weights of parts of the piston and rod assembly are as follows:

	Lbs.
Piston	1.621
3 Rings .....	.197
Pin .....	.272
Rod	2.444
Total	4.534

The front end drive is a Link Belt silent chain with idler sprocket which automatically maintains the tension. The drive system with idler is said also to act as a vibration dampener. Inspection of these parts is provided for by an easily removable cast aluminum cover plate.

The camshaft, which is a heat-treated forging of No. 1015 steel, is carried in four bearings in the left side of the crankcase. The dimensions of these bearings are as follows:

	Diameter	Length
No. 1	1-5/16 in.	1-31/32 in.
No. 2	1-51/64	1-1/8
No. 3	1-25/32	1-1/8
No. 4	1-1/16	1-13/16

The No. 1 bearing is held in a retainer bolted to the crankcase. This retainer is removable to permit withdrawal of the camshaft endwise. One-piece valves are used, the inlet being tungsten steel and the exhaust silchrome steel. The former are 1¾ in. in diameter and the latter 1½ in., both having a lift of 11/32 in. The valve springs are inspected and tested individually for uniformity of tension. Pushrods with roller type cam followers actuate the valves.

Generator and water pump are mounted on brackets cast on the right side of the crankcase. The generator is

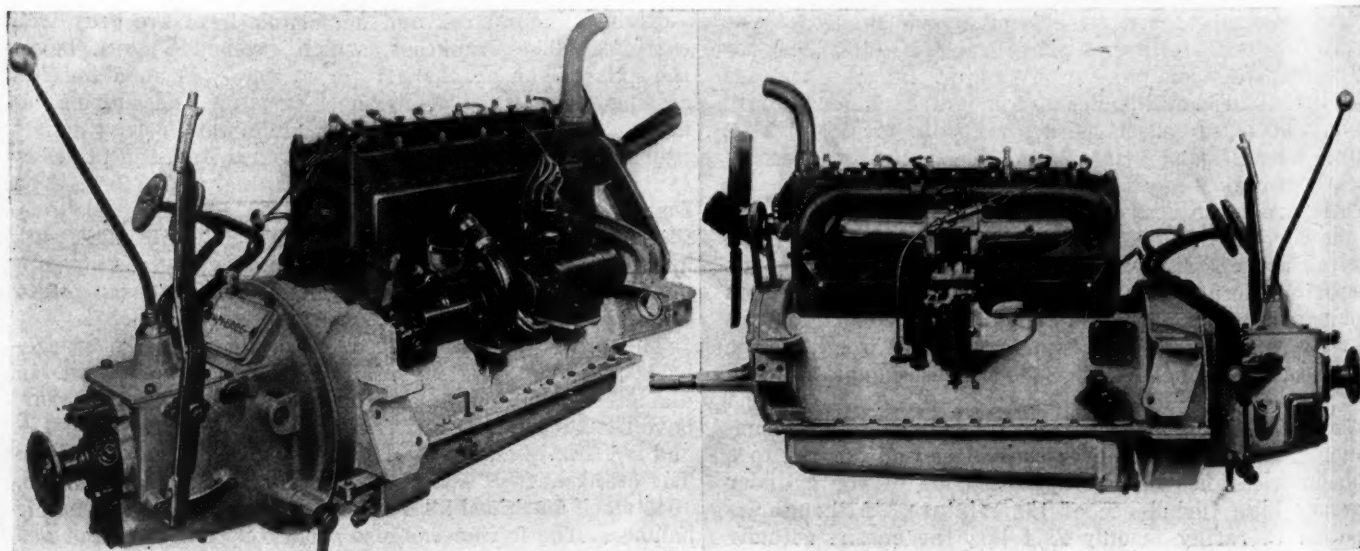
driven through a flexible fabric coupling and the pump is in turn driven through a second fabric coupling from the rear end of the generator shaft. The ignition unit is integral with the generator and is driven from it.

The electrical system is a six-volt, single wire, two unit Delco with 120 amp. hr. Willard battery. Both manual and automatic spark advance are provided, the respective ranges being 40 and 17½ deg., measured on the flywheel. Conduits extending along the top of the engine protect the high tension cables, and the lighting circuits are similarly cased and are protected by fuses. The lighting switch, which is combined with the ignition switch, provides four different connections. In one position, only the tail lamp is lighted; in another, the auxiliary headlights are thrown on for city driving; a third position dims the headlights and a fourth throws on their full intensity. Fender type headlights with Bausch & Lomb non-glare lenses are regular equipment on all models. Mounted in combination with the tail lamp, are the stop and backing lights, the latter being operated automatically when the gearshift lever is placed in reverse. The spark and throttle levers, which together with the horn button are mounted on top of the steering column, are of the short lever type without quadrants.

Carburetor and Adjustments

The carburetor is similar to that used on the Series 33. It is of the automatic float feed type with accelerating well, and reed valves which automatically provide the proportion of air. Adjustments are provided on both main and idling nozzles, the former being controlled from the dash. A large size Stewart vacuum system is used, instead of the pressure fuel feed employed on the Series 33, to feed gasoline from the 18 gal. tank at the rear of the chassis to the carburetor. A Tee connection is inserted in the gas line just before it enters the carburetor, and from this connection a pipe runs up to the primer located on the intake manifold. This primer is controlled from the dash, and its function is to supply gas to the intake manifold for cold weather starting. The exhaust and intake manifolds are separate castings. The latter has a jacket to which exhaust gases are admitted by a valve in the exhaust manifold which may be adjusted for weather conditions.

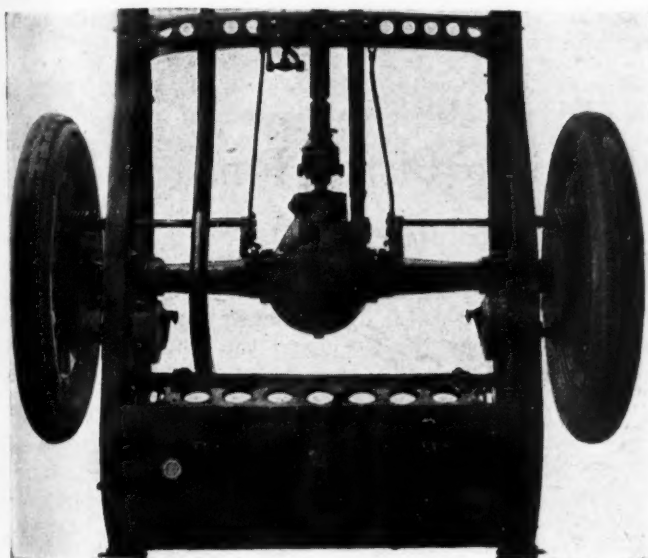
Cooling water is circulated by a centrifugal pump. The water is distributed evenly between the cylinders by baffles. The radiator is a ribbon cellular type of Fedders



Right and left side views of the new Pierce Arrow lighter six engine which has a piston displacement of 289 cu. in. compared to 415 in the older model which is continued

make with a pressed steel shell. A thermostat is installed in the cooling water outlet to check the flow until a predetermined temperature is reached. The fan is supported on a bracket bolted to an extension of the cylinder, and is driven by a V belt from a pulley on the end of the accessory drive sprocket shaft. An eccentric adjustment for the belt is provided.

Oil is supplied under pressure to all main, connecting rod and camshaft bearings by a gear oil pump which is driven through helical gears from the camshaft at a point just forward of the rear bearing. The bottom of the crankcase slopes backward and the oil pump is located at its lowest point. It is readily accessible for either inspection



The rear axle of the new chassis is semi-floating with ring and pinion mounted on a removable carrier

or cleaning. The oil filler tube is fitted with a strainer and the lubricant is again strained before entering the pump. Cylinder walls, piston pins and valves are lubricated by splash. A pressure relief valve and bypass located at the rear of the engine on the left control the pressure, adjustments for high and low speeds being provided. The relief valve is regulated at the factory to give one-half pound of pressure for each mile per hour of maximum car speed. A trycock with extension handle is provided for determining the oil level in the crankcase. The drain plug valve also has an extension handle so that it may be operated from above.

The unit powerplant construction is used in the new car, whereas in the Series 33 the transmission is located amidships as a separate unit. The clutch is a single plate Borg & Beck and the transmission is a Brown-Lipe, built to Pierce-Arrow designs and providing the following ratios:

First	3.33 to 1
Second	1.68 to 1
Third	1 to 1
Reverse	4.35 to 1

Gears and shafts are heat-treated, case-hardened, ground and lapped to secure quietness and durability. Both main and counter shafts are mounted in annular ball bearings. The gearset case, which is an aluminum casting, has an oil filler which also serves as a gage. The speedometer is driven from a helical gear on the tailshaft.

The propeller shaft is tubular and is fitted with Spicer universals at both ends. The rear axle is a semi-floating

type with spiral bevel gears providing a reduction of 4.45 to 1. The ring and pinion gears are lapped to insure quiet operation. To facilitate repairs the differential is mounted in a removable carrier. Axle shafts are of chrome nickel steel and may be removed without disturbing other parts of the axle by taking off the wheels and removing the roller bearings supporting their outer ends. Propulsion is taken through the springs and torque by a pressed steel arm which is supported at its forward end by a rubber fabric member attached to a frame cross member.

Both the front axle (which is a reverse Elliot type) and the steering knuckle pivots are chrome nickel steel drop-forgings. The steering arms are drop-forgings of nickel steel. Knuckles are machined to give the wheels a camber of 3 deg. The wheels turn on roller bearings which are adjustable and protected with felt washers and metal retainers. A ball thrust bearing with adjustments for end play is provided for the steering pivot pin. Tie-rod and drag link are of seamless steel tubing and the ball joint connections are fitted with covers to retain lubricant and exclude dirt and water. These parts are designed to eliminate play in the steering connections and are fitted with springs to prevent rattle. The steering gear is a worm and wheel type of Gemmer make with 18-in. walnut wheel finished in mahogany. The turning radius is only 21½ ft., which makes for easy handling in city streets.

The brake layout is exactly the same as that used on the Series 33, except for the sizes of the ribbed drums. The brakes operate internally and with equal pressures on both front wheels regardless of the position of the steering wheel. Front wheel brakes are operated by shafts carried in the axle forgings, which actuate the brake expander cam blocks. The service brake pedal operates all four brakes, while the hand brake applies only those on the rear wheels.

The frame side members have a channel section, the material being 0.30 carbon steel. They are 7½ in. deep, have 2½ in. flanges and are made of ⅜ in. stock. There are four cross members, three of which are reinforced by gusset plates, the fourth being a tubular member extending between the front spring front supports. The other cross members are located at the radiator, at the rear of the transmission, and at the front end of the front springs. In addition, there is a wide plate at the rear which also supports the tire carrier. The side rails have parallel ends so that the springs can be placed directly below them to minimize wear on shackles, spring bushings and bolts. The springs are semi-elliptics and are hung from the frame by drop-forged brackets and shackles. Front springs are 38 in. long by 2 in. wide; rear springs, 56½ x 2¼ in.

Springs Built for Balloon Tires

To provide for low pressure tire and four-wheel brake equipment the main leaves of the front springs are made of heavy gage alloy steel and all other leaves are so graded and of such material as to carry all static and brake torque loads safely. The springs are doweled and securely fastened to the spring pads of the axle beams. The rear spring seats are of the oscillating type used on the Series 33. The tires are 32 x 5.77 in. semi-balloons, for which the recommended inflation pressure is 35 lb.

The seven body styles are roadster, four and seven-passenger phaetons, five and seven-passenger sedans, seven-passenger inclosed drive limousine, and a coupe. The body framework is of hard wood with glued and screwed joints, and metal bracing. The panels are of aluminum and are filed and sanded before finishing. The windshield is a slanting, two-piece design, the lower half being held in a rubber channel and the upper half swing-

ing outward. In the open models, the seat coverings are of pebble-grained, dull black leather. In the closed models the upholstery is mohair, in colors to match the exterior finish. Royersford springs are used in the cushions and templates are employed by the trimmers in shaping the seat contours. Rear cushions are 14 in. from the floor and the front 12 in.—both have a pitch of $3\frac{3}{8}$ in.

The instruments are arranged in three groups, the left group being the lighting and ignition switch, the center the speedometer and clock, and the right the ammeter and oil gage. The panels and faces of the instruments are dull black with white numerals, while the frames are Butler finish.

Two color options are offered on the seven-passenger phaeton and the five-passenger sedan. On the former the body may be had finished in either of two shades of blue,

with wheels to match and gray striping. On the latter the optional colors for body and wheels are Royal blue and Brewster green, with gray striping. In both cases fenders, frames, etc., are finished in black. Radiator shell and other metal parts are finished in nickel. The finishes on other models have not been announced.

Regular equipment on all models includes front bumper, tools and jack, lock on tire carrier and switch with universal key, treadle type accelerator pedal, large cowl ventilator, adjustable sun visor, automatic windshield cleaner, Zerk chassis lubrication system, Gabriel snubbers, automatic windshield cleaner and rear view mirror. The phaetons have tonneau lights and the closed models have dome lights, vanity case, gentlemen's case, mirror, and silk window shades. All windows are fitted with crank regulators and doors have locks.

New Mirra Machine for Lapping Piston Pins

THE new Mirra lapping machine, which is being manufactured by the Reed-Prentice Co. of Worcester, Mass., and of which an illustration is being shown herewith, is especially adapted for the lapping of piston pins and similar cylindrical work. The pins are laid loosely on a quick-loading spider which is located between two lapping wheels rotating on vertical axes. The wheels rotate in opposite directions and at slightly different speeds.

The illustration shows the spider in the loaded position, the piston pins resting on the lower wheel. When lapping, the upper wheel is brought down onto the pins under pressure, and the variations in wheel speed cause the pins to rotate between the lapping wheels and to creep slowly in a circular path.

Owing to the fact that the projecting arms on the spider are not radial, the piston pins when rotating are subjected to a rotating-sliding action between the wheels. The center of the spider rotating on an eccentric, gives three distinct motions to the work relative to the wheels:

1. Creeping of the work caused by the variation in wheel speeds.
2. Sliding-rotating motion caused by the work being set at an angle to the center of the wheel.
3. Eccentric spider motion giving an in-and-out sliding action of the piston pin from the center of the wheel.

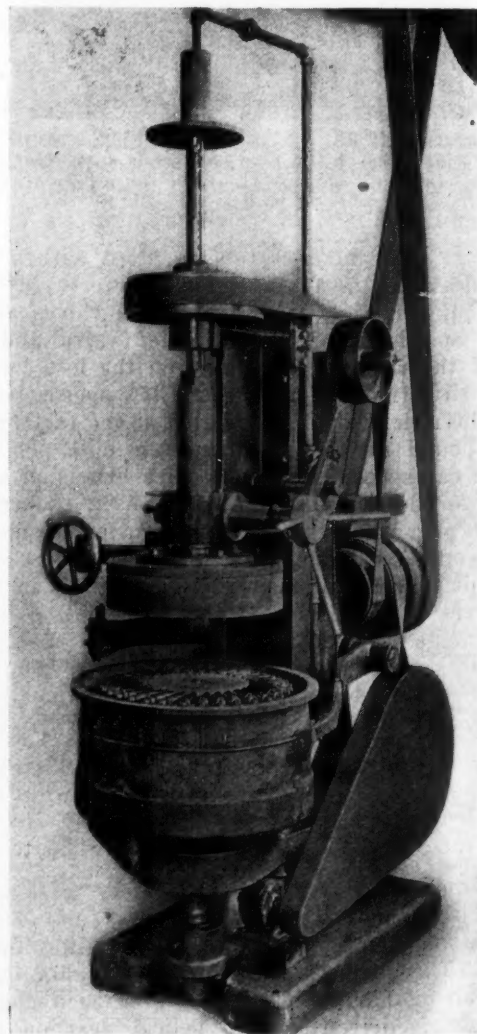
A finished surface highly polished and free from grooves is claimed to be obtained by this process, which consists of two operations, rough lapping and finish lapping or polishing. The rough lapping is done by means of a fine grinding wheel, while the finish lapping is by a soft elastic wheel giving a highly polished surface. The roundness is said to be easily kept to within 0.0001 in., the taper within the length to 0.0001 in. and the diameter to within plus or minus 0.0001 in. It is further claimed that this method not only permits of very accurate work but makes a high rate of production possible.

Two Wheels Independently Driven

The machine is made with two wheels on vertical axes which are independently driven from a pulley shaft at the rear. The wheels are located in separate heads mounted on a heavy column. The lower wheel is fixed vertically, while the upper one slides vertically, its movement being controlled by a pilot handwheel on the side of the machine, similar to that on standard drill presses.

A double end diamond wheel dresser is located on the left side of the machine. This permits both wheels to be dressed independently by the same mechanism, which is operated by a conveniently located handwheel.

A pump is piped from a water tank to the wheel spindle and delivers lubricant to the work in a constant flow. In order to prevent rusting, a special compound is used. When the upper wheel is lowered onto the work, a circular guard surrounding the work and the wheel is automatically raised and prevents the compound from being thrown off.



Mirra lapping machine which has two wheels independently driven

What Promise Do Danish and Norwegian Markets Hold for Automobiles?

Excessive import duties which were imposed in an effort to check the rapidly depreciating currencies of the respective countries have brought the sales of automobiles almost to a standstill.

By Birger Jacobson

IMPORTS of automobiles into both Denmark and Norway took a sudden and unexpected drop in 1923, and for the same reasons. Both countries are suffering from depreciated currency and excessively heavy import duties hastily imposed, along with business depression.

In an effort to check the rapid depreciation of currency in the respective countries import duties were increased for the period of a year, which will end early in 1925. It is expected that the additional duties will be removed then, for not only did they fail to reestablish the value of the currency, but the reaction against this legislation was strong, and with the elections in Denmark another political party came into power.

The fall in the value of currency was greatest in Denmark where the krone normally worth 19.3 cents, depreciated until today it is worth between two and three cents.

Rapid depreciation over a period of years came close to causing a panic and in an effort to check it the political party in power at the time enacted radical and ill-advised legislation which hurt rather than helped the situation. The import duties were imposed under the name of "Trade Taxation" for the period of one year to end February 1, 1925, which covered sales of new passenger cars traded. Unregistered passenger cars, including those which the dealers had on their floors at the time, were included as well as new imports. The new law went into effect almost over night.

The result was that the government lost more in regular import duties than it could hope to gain from this special sales tax, for automobile exports fell off alarmingly. It created an impossible situation for the dealers, many of whom are inexorably being forced to the wall.

Competition Is a Factor

American cars are popular in Denmark, but they are forced to meet the competition from the smaller French, Italian and German makes. These European cars find their sales there thanks to good roads and the very flat country, and to their small motors with low horse-power rating. Registration taxes are very similar to those imposed in England, and are based entirely upon the cubic displacement of the motor and not upon the weight of the car. Incidentally the speed limit is often as low as five miles in towns and villages with their quaint narrow streets, though practically unlimited in the open country.

The railroads in Denmark are largely owned by the government. After the war it was necessary to raise the rates to a point which made buses so profitable that the railroads in certain parts of the country claim they are being ruined. Specially built buses are not to be found in any great numbers, but due to the cheapness of some American one ton truck chassis many of the latter have been converted with passenger carrying bodies. There is a market for modern bus chassis suitable for bodies carry-

ing up to thirty passengers, but it will probably be necessary for the American manufacturer to put some of his chassis in operation and show results.

Failure to get the desired results—increased value of the krone and improved business conditions—resulted in the election of the Labor Party in Denmark, and it is anticipated that the "Trade Taxation" will be removed on February 1, 1925. With continued improvement the value of the krone and the reduction of taxes Denmark will offer a live market for the American manufacturers who can give their dealers the necessary cooperation over this year which will obviously be lean.

In Norway the krone which has a normal value of 26.8 cents has depreciated to a present value of just half, thirteen and a fraction cents. Norway like Denmark attempted to check the falling krone by taxation and increased duties.

Duty Increased to 33 1/3 Per Cent

It was believed that the enormous imports of what they termed luxuries caused the decline, so a surtax custom duty of 33 1/3 per cent was imposed on all automobile imports. The new surtax duty applies on the amount of the duty which was already in force, a straight 25 per cent on the c.i.f. Norway port price, and the total amounts to 33 1/3 per cent of the landed cost of all cars. In other words the import duty today amounts to 25 per cent plus 33 1/3 per cent of that same 25 per cent of the port price or 33 1/3 per cent.

As a result imports of automobiles and all automotive goods are almost at a standstill, and dealers are very hesitant in placing new orders.

Unlike Denmark which is essentially a level dairying country, Norway is very hilly. American light and medium sized cars perform well on the short steep grades and are consequently popular. The motoring public which is large in Norway prefers American cars to those of European make, because of their hill climbing ability and comfortable arrangements for the driver. It also prefers passenger cars with left hand drive and battery ignition, trucks equipped with magnetos and, because of certain road regulations, pneumatic tires.

Just before the new import duties on automobiles were determined, the Royal Norwegian Automobile Club, which has considerable authority in all matters pertaining to automobiles, sent a letter to the governmental authorities condemning the proposed excessive luxury duties. It was pointed out that the automobile was not a luxury, but a necessity, and that four-fifths of the road taxes were paid by private car owners. Despite their protest this almost confiscatory legislation was enacted.

Imports of automobiles have been low since 1921, but now with a considerable increase in shipping, it is expected that automobile imports will increase and that as a country Norway offers an excellent potential market.

Scuffed Pistons Result from Cold Jacket and Lack of Oil

If bearing clearances are small lubricant often fails to reach cylinder walls for five or more minutes after engine is started. Rust, formed rapidly when temperature is low, is avoided when hot water is circulated. Effects of intermittent running are serious.

By Frank Jardine

Engineer, Aluminum Co. of America

ENGINES which have close big end bearing clearances frequently run for five or more minutes before oil from the pressure feed system reaches the cylinder walls. This is true under ordinary room temperature conditions. At lower temperatures the period of dry running is lengthened. This often results in scored or "scuffed" pistons. Increasing the clearance or providing suitable oil grooves obviates this difficulty.

Very small quantities of oil are sufficient to lubricate pistons and cylinders when the engine is hot, but at lower temperatures and when running is intermittent rust is formed with incredible speed and scuffing is increased. The rust is attributed to water which tends to destroy the lubricating value of the oil. Rust does not form in cylinders through which hot jacket water is being circulated.

These are among the interesting and important facts established in tests made during the past 18 months in the laboratory of the Aluminum Co. of America, Cleveland, Ohio, on five well-known engines employing pressure lubrication. These tests were carried out through a temperature range from minus 20 deg. Fahr. to 200 deg. Fahr., the low temperature being obtained in the refrigeration room of the laboratory and the high one by using hot oil, and circulating boiling water through the water jackets. All results were checked by road tests in hot and in cold weather.

In order to observe the functioning of various lubricating systems the cylinder head of the engine under

observation was removed and the heads of the pistons were cut off just below the rings. A section about 1½ in. wide then was cut out of the thrust face of each piston. This made it possible when the engine was driven by the dynamometer to look down the cylinders and see just how much oil reached the cylinder walls at various speeds and oil pressures. The altered piston is shown in Fig. 1.

In the case of several engines tested in this manner, under oil pressures of 25 to 35 lb. and speeds up to 1500 r.p.m., equivalent to about thirty miles per hour, no oil at all reached the thrust faces of the pistons during the 5 min. running, even though both engine and oil were at room temperature—a much more favorable condition than though both were cold.

Upon going into the cause of this failure in lubrication it was discovered that the side clearances on the connecting rod bearings were in some cases as low as 0.002 in. and that clearances of 0.004 in. were fairly common, while the fit of the rods on the crank pins was often so close as to be difficult to measure. Such close fits as these allow practically no oil to pass through the connecting rod bearings.

Pistons Scored with Cold Jacket

When these close clearance engines were operated under their own power at temperatures around zero Fahr., or in many cases if they were simply set up on the block and operated with cold water at 35 to 45 deg. Fahr. circulating through the jackets, it was found possible to score the pistons in a comparatively short time. See Fig. 2. If the side clearances were increased to 0.010 in. and the diametrical clearances to 0.0015 in. conditions were found to be very much improved. The amount of scoring always was decreased and if not eliminated it was found possible to do so by cutting a groove about 3/16 in. wide and 1/16 in. deep across the face of the connecting rod bearing about 15 deg. back (toward the thrust side of the engine) of a plane through the centerline of the rod and the crank. At the ends of this groove small vertical slots about 3/16 in. wide and 1/16 in. deep were cut in the sides of the bearing. See Fig. 3.

Oil was found to collect in these side slots and to be thrown up into the cylinder as the rod passed over the top of the stroke. This arrangement was successful in curing all except the most stubborn cases in which it was necessary to cut a 3/16 x 1/16-in. circumferential groove or grooves in the connecting rod bearing, connecting with the cross groove and placed so as to register with the oil hole in the crank pin, as shown in Figs.

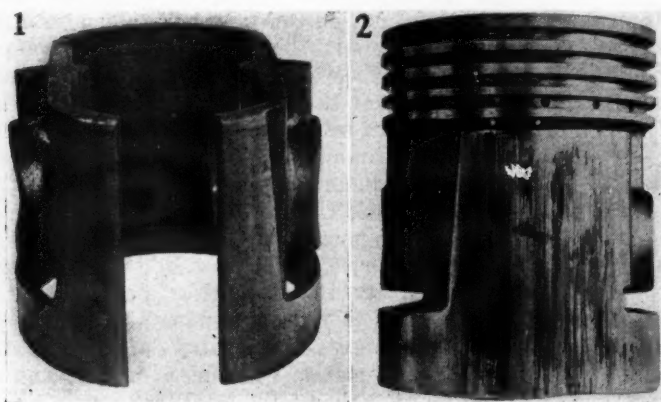


Fig. 1—Cutaway piston used in tests to determine how soon after engine starts oil reaches cylinder walls

Fig. 2—Piston which has been "scuffed" or scored due to lack of proper lubrication when engine is started

4 and 5. The length of this groove varied from 60 to 180 deg. and extended from the cross groove back on the thrust side of the rod.

When the oiling systems had been worked out so that the pistons could be run under cold weather conditions without scoring, it was found when the headless pistons were put in and the cylinder head removed that the cylinders received plenty of oil within half a minute from the time the engine started to turn over. To put this conclusion in another form, when the oiling was so arranged that plenty of oil could be seen to reach the cylinder walls the engine ran under cold weather conditions without damage to the pistons.

Scoring referred to above, and which perhaps is more properly called "scuffing" as being a more descriptive term, was not the ordinary marking to be seen on a piston which has seized at high temperature, but consisted of dry black streaks which seemed to be rubbed into the surface of the metal.

Short Runs Result in Scuffing

This was a condition which was not developed at all by continuous running at high speeds but by intermittent operation at moderate speeds and loads. The test which finally was developed, and one which would produce scuffing of the pistons if it were to be produced, consisted in giving the engine under test five 5-min. runs separated by 30-min. periods at a speed equivalent to 25 m.p.h. in high gear and under a load of about 50 per cent of the rated power of the engine at that speed. The load was thrown on as soon as the engine was started and the cold water (35 to 45 deg. Fahr.) was circulated under 15 lb. pressure through the jackets during the running and idle periods.

As stated above, scuffing was eliminated by throwing more oil into the cylinders. Strangely enough it was eliminated also by simply raising the cooling water temperature from 35 to 125 deg. Fahr. This was invariably the case. No matter how severe the scuffing might be it disappeared entirely if hot water were circulated through the jackets. It became evident that a very small amount of oil is sufficient to lubricate the pistons if the cylinders are hot, but a greater quantity was necessary if they were cold. Apparently something happened in the cold cylinders which ruined the lubricating properties of the oil remaining on the cylinder walls when the engine last was stopped.

When the cylinder heads were removed from engines which had been operated in the cold room at temperatures around zero and below it was noticed that a coating of rust had formed on the cylinder walls even though they were covered with a film of oil. This rusty coating formed with almost incredible speed, inside of 10 or 15 min., and would absorb what oil was present leaving a dry, red surface on the cylinder walls. The rusting was not entirely confined to cold room engines but occasionally was to be seen in a less aggravated form in engines which had been run on the block with cold water circulating through them.

Water in Crankcase Oil

It was observed also that when the oil pan was removed from engines which had been operated on the block under cold water conditions, large drops of water frequently would be found clinging to the crankshaft and the oil which was on the pistons when they were removed was of a dirty yellow color, as though it were loaded with water. This was never the case when hot water was circulated through the system.

These facts led to the supposition that the basic cause

of all the trouble was condensation on the cold cylinder walls of water which ruined the lubricating properties of the oil film, and, under certain conditions, caused the cylinder walls to rust, thus increasing the scuffing. Exhaustive tests proved this supposition to be correct. The oil which was on the pistons after they had been run through the five start test described above was found to contain 25 per cent of water.

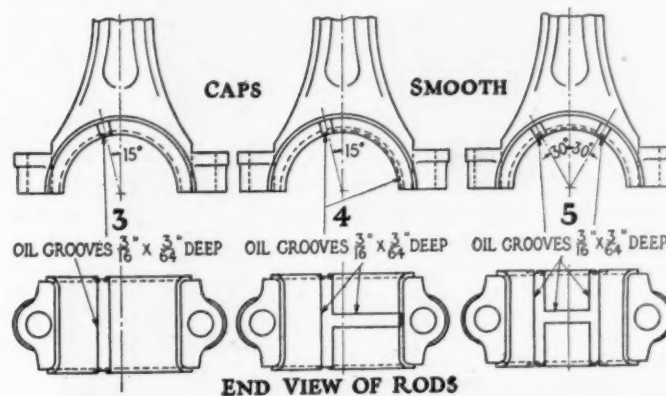
Only a few tests which bear very directly on the problem are described here, though many others were made. For instance, it was found that if the oil pan were removed and the pistons put in with only a little oil smeared over the surface, the engine could be operated for as long as 15 min. under heavy load with no damage so long as the cylinder walls were kept hot. If the cylinders were cooled down to 40 deg. Fahr., however, the pistons quickly were marked. In other words, a very little oil was sufficient to maintain lubrication if something did not take place to destroy its lubricating properties.

A device then was made for injecting water into the thrust side of the cylinder about 1½ in. from the bottom. With the oil pan in place and containing the normal quantity of oil, by giving the pistons a small shot of water half a dozen times during the two 5-min. runs a most severe case of scuffing was produced with hot water (180 deg. Fahr.) circulating through the jackets. This was accepted as proof that the scuffing in other tests mentioned above was caused by condensation of water inside the cold cylinders.

Water Causes Rust in Cold Engine

In connection with the rust formation a number of very interesting experiments were tried. In one case the oil pan was filled with water instead of oil, a sufficient quantity being used so that the rods dipped deeply and the cylinder walls were kept well splashed. Hot water (180 deg. Fahr.) was circulated through the jackets and the engine was driven with the dynamometer for the regular five starts and then allowed to stand over night. The next morning the cylinder head was removed and the cylinders were found to be clean and bright. The hot walls had dried off as soon as the engine was stopped.

The same experiment was repeated except that cold water was circulated through the jackets. When the second start was attempted after the first 30-min. idle period, the engine was difficult to turn over and squeaked slightly. After the second run the cylinder head was removed immediately and every piston was found rusted into its cylinder so tight that it had to be driven out with a hammer. Cylinder walls were covered with rust and



Figs. 3 to 5—Drawings showing methods of grooving upper half of big end bearings on engines with pressure feed systems, when bearing clearances are so small that oil does not reach cylinder walls soon after engine is started

were scored throughout their length. Pistons, of course, were ruined utterly. In this case the water had not been driven off the cylinder walls when the engine was stopped, but had remained to cause the rusting.

In an effort to discover some lubricant which would resist the formation of rust on cylinder walls, cold water was circulated through a block which previously had had each of its six cylinders coated with a different grade of engine oil. The oils used included Mobile "A," "B" and "Arctic" and Texaco light, medium and heavy. Water was condensed from the air on the cold walls, all of which became thoroughly rusted within 48 hr. If, however, castor oil were used, more than a week was required to produce an appreciable amount of rust and this rust was not nearly so adhesive as that which formed in the presence of the ordinary lubricating oils. From this it would appear to be good practice to give cylinder blocks which are to be shipped or stored in cold weather, a coating of castor oil, which appears to be very effective in preventing rust and yet need not be present in sufficient quantity to produce stickiness when the engine next is started.

Engine Should Heat Up Rapidly

From the foregoing it is evident that a number of features ought to receive careful consideration in the design of new engines to insure adequate lubrication of pistons and cylinders. Cooling systems should be designed with a view to getting the engine up to an efficient operating temperature as quickly as possible after starting. To this end the water jackets should be made

short and of relatively small capacity. The use of thermostats to control circulation until the jacket water is warm is to be recommended. Not only will this construction improve lubrication conditions and requirements, but it will reduce greatly the accumulation of water in crankcase oil, which is becoming a very serious consideration as water in quantities of over 5 per cent is known to raise rapidly the coefficient of friction.

As to lubrication systems, the advantages of pressure feed to main and connecting rod bearings cannot be denied; the same is true of splash to pistons and cylinder walls. Splash feed is the only simple system in common use which cannot fail to deliver oil to pistons and cylinders just as soon as the engine starts to turn over, regardless of temperature. This statement is borne out by the fact that scuffing of pistons as described above is practically unheard of in engines employing splash feed. It would seem, therefore, that pressure lubrication to main and connecting rod bearings with splash to pistons and cylinders is a most desirable combination.

The importance of plenty of clean oil as a means for eliminating noise, smoothing out operation and prolonging bearing life is being realized rapidly. This fact is evidenced by the tendency to install filters and to flood cylinders with oil, controlling the excess by means of special rings or removing it from the bottom ring with some auxiliary device. All of these practices, which insure a plentiful supply of clean oil at all times are to be recommended highly and are certain to result in greatly prolonged life of wearing parts and in increased satisfaction to owners.

Combination Flash and Water Tube Boiler Developed

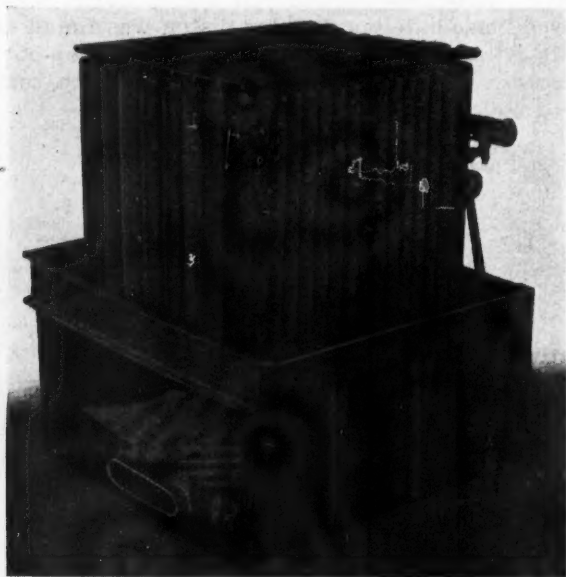
FREDERICK W. BALSTER of Wilmington, Del., has invented a new form of steam boiler and plans to form a company for the manufacture of steam buses, trucks and railcars.

The boiler is an all-welded construction and embodies some of the features of both the water tube and flash types. It has a water level but it has also been operated as a flash boiler. It is of the sectional type, each section being a combination of pressed steel shells and seamless drawn tubes. If one section of the boiler should become

defective in use it can be shut off from the rest by means of a valve. The sections are interchangeable and, as those nearest the fire naturally are subjected to the greatest deterioration, these can be interchanged with those in the upper part and the life of the whole boiler thus increased.

This boiler has been built into an old car for demonstration purposes. The steam pressure is carried at 600 lb. p. sq. in. and the steam is highly superheated. It is claimed that owing to the large water capacity and the insulation of the boiler the latter may be kept hot for 48 hours without the aid of the pilot.

Both the main burner and the pilot burn kerosene and are supplied from the same fuel tank. A single fuel nozzle discharges into a bifurcated mixing tube, and baffles and equalizing ducts in the burner are said to insure an even spread of the flame over the whole burner surface.



Balster all-welded steam boiler

THE International Union of Street and Suburban Railways and Motor Omnibuses held a congress in Paris during June, and one of the interesting subjects discussed was that of engines for motor buses. In a communication by M. Bonhomme the claim was made that the efficiency of these engines could be increased by the use of aluminum pistons and that for France the most economical fuel was a mixture of alcohol with gasoline or benzol. There was evidently a great future for gas producers, which, however, were not yet developed sufficiently for passenger transport, although they were used successfully for heavy transport in country districts. In the discussion the suggestion was made that electric omnibuses be substituted for the present gasoline type, but this was declared to be impracticable on account of the limited mileage of such vehicles on a single charge. The next congress will be held in Barcelona in 1926.

Here and There in Foreign Markets

By special arrangement with the Automotive Division, Bureau of Foreign and Domestic Commerce

American Cars Sold in England

STANDING third among our national passenger car markets in 1923 and seventh among truck markets, the United Kingdom is already a well developed field for American manufacturers. Importers of American cars are optimistic and are expecting their business to increase anywhere from one-third to three-fourths when the duties are repealed.

There are 108 British makes of passenger cars on this market at present, and 77 foreign makes, of which 38 are French and 19 American. It is estimated that the tire consumption per car is approximately six per year. It is estimated that not more than 20 per cent of the total number of tires used in Great Britain are inch sizes. So far as known, only one British car manufacturer equips his car with inch size tires, the size being 30 x 3½.

The popularity of American automotive products is unquestioned and their low prices give them further preference. Future prospects for increased trade may therefore be regarded as brighter than at any other time since the inception of the motor industry.

Seasonal Slow-Up in Philippines

PHILIPPINE business during June and early July showed some slight improvement, due largely to seasonal activity in certain lines, but it is generally expected that business will be slower for the next two months, due to the start of heavy rains on July 13. Throughout the sugar districts, crop reports continue optimistic. The local copra market registered considerable activity during the first half of the month as a consequence of heavy buying in the London market as well as by local oil manufacturers. The hemp market also strengthened during the closing days of June, especially in the medium grades.

Sales of passenger automobiles and trucks as well as tires and accessories are falling off, but the decline is only seasonal and normal business is expected in these lines as soon as the rainy season is passed.

Belgians Like American Cars

IN Belgium prior to the war automobiles were a luxury and were confined entirely to the wealthy. In the early part of 1919 there were in Antwerp, a city of about 400,000 population, less than a dozen privately owned cars. During the following four years, however, the increase in number was phenomenal, and by the end of 1923 it was estimated that at least 50,000 passenger cars and about 22,000 trucks were in use in the country.

Belgium imported 13,210 motor vehicles and exported 8273 in 1923. The great increase in this decade in the import figures is due largely to importations of a low priced American car whose assembling plant was established in 1921 in Antwerp.

Similarly, since a considerable part of the cars assembled at the Belgian plant of this American concern are exported to Holland, Germany and France, the increase in exports during 1923 is due principally to re-exports of this completed American car.

American cars enjoy a reputation equal to that of European cars, and the moderate priced automobile of American manufacture has a firm hold on the Belgian market. The use of motor trucks and heavy trucks, introduced by the armies, have rapidly replaced horses, on account of the saving in operating costs and the rapidity with which deliveries can be made. Local manufacturing of heavy trucks is entirely inadequate to the demand. There has recently been a decided reaction against the heavy type of motorcycle produced in the United States, and the lighter machines with lower gasoline consumption are now being favored.

Australian Outlook Optimistic

IN Australia automobile sales are holding up fairly well, and the All-British Automobile Show at Melbourne is apparently having no serious effect upon sales of American cars.

The Federal Government has recently appropriated the sum of £90,000 for immediate use in connection with road building and another Federal grant of £500,000 to be used for road development in the back districts is being pushed through the House of Representatives.

Australia's imports during May aggregated £12,700,000, as compared with £10,049,000 during April. Of imports, £1,300,000 represented automobiles.

Imports of Tires into India

IMPORTS of tires into India during the fiscal year ended March 31, 1924, amounted to 174,770, and in value to 9,996,469 rupees. The share of the trade of the principal exporting countries during the year was as follows: United Kingdom, 35 per cent; France, 31 per cent; United States, 13 per cent, and Germany, 11 per cent. Large firms of the first two nationalities have branch offices in both Bombay and Calcutta and others have agents chosen from among the importers of automotive products.

China Markets Active

RETAIL sales of automobiles in Shanghai and North China continue good, although the continued heavy shipments is causing a general increase in local stocks. Shanghai imports during May totaled 181 cars, the highest figure recorded for eighteen months. Of this total 126 came from the United States, 35 from England, 3 from France and 17 from other countries.

The competition from light European cars is increasing in Shanghai because of their low fuel consumption.

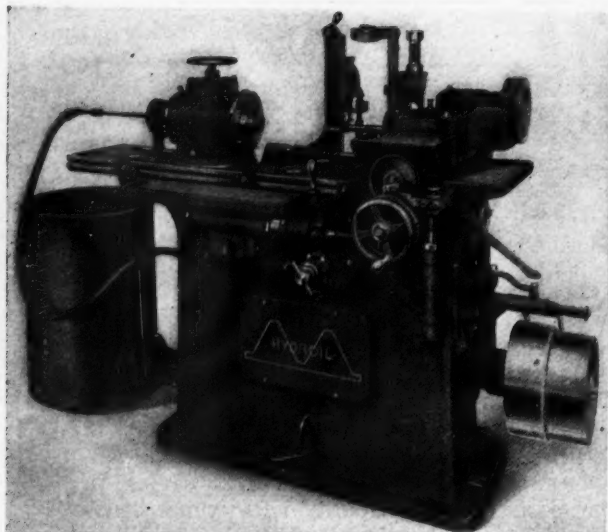


Fig. 1—Front view of No. 51 Hydroil grinder showing throttle valve hand nut, cut-off valve and automatic feed hydraulic cylinder

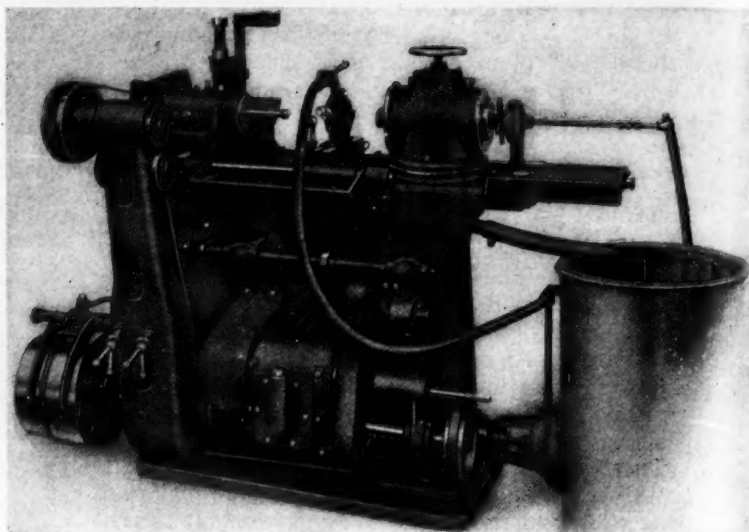


Fig. 2—Rear view of same machine showing main oil pressure line, gear shifter plunger and coolant lines

New Internal Grinder Has Hydraulic Drive and Feed

Greenfield Tap and Die Corp. machine has unusually high table speeds made possible by hydraulic feeds. Clutch operation may also be effected hydraulically. Wide abrasive wheels used.

By W. L. Carver

HYDRAULIC actuation of the reciprocating work head and of the automatic feed mechanism, which latter positions the wheel spindle carrying an abrasive wheel of double or even treble the ordinary width, and the availability of hydraulic operation of the chuck, are outstanding features of the Hydroil internal grinding machines which are built by the Greenfield Tap & Die Corp., Greenfield, Mass. These features are incorporated in a construction which is entirely self-contained except for the coolant tank, and is driven by a single belt. The characteristics of the hydraulic operation have permitted increasing the table speeds from 500 to 800 per cent over what was prevailing practice a few years ago. As this factor increases the lead per revolution of the work, abrasive wheels of $1\frac{1}{2}$ in. and greater width are used, and cut over practically their entire widths. On some jobs of fairly large diameter and moderate length these features have combined to allow the removal of more than 1 cu. in. of hardened steel per min.

These machines are built in two sizes—No. 51, having a swing of 10 in. and grinding 4 in. deep; No. 52, with a swing of 16 in. and grinding 9 in. deep. The first has five changes of work head speed, ranging from 175 to 500 r.p.m., while the second has six changes, varying from 150 to 400 r.p.m. As illustrated by Fig. 1, which is a front view of the No. 51 machine, the drum which drives the work head through a vertical belt is inclosed in the base and raised out of the arc of the belt by the treadle which is shown to bring the head to a stop. The same action engages a brake at the work spindle. Table speeds from zero to 36 ft. per min. are employed on the usual

range of operations on the No. 52 machine, while the No. 51 machine is operated successfully with table speeds as high as 55 ft. per min. The hydraulic table reciprocation provides an infinite number of table speeds and the full range is controllable by a throttle valve which is located on the front of the machine. With a $\frac{3}{4}$ in. stroke, the table of the No. 52 machine can be reciprocated 300 times per min. and that of the No. 51 machine 400 times per min. automatically, without shock.

A Brown & Sharpe pump, which is located on the back of the base of the machine and driven from the change speed drive shaft by a silent chain, draws oil through a filter from a compartment in the base and supplies about 100 lb. per sq. in. pressure for the operation of the table, automatic feed mechanism and (if desired) a hydraulic chuck at the work head. The work table is operated by

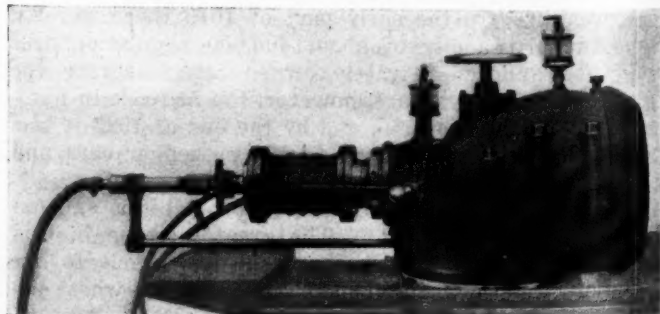


Fig. 3—Front view of hydraulically operated head with control lever in center

a ram in a bronze cylinder which is located in the interior of the base. The two ends of this cylinder are controlled by the cutoff valve and dogs on the front of the bed and table respectively. The excess capacity of the oil pump above that required for operation of the work table is diverted for the operation of the automatic feed mechanism cylinder which is shown at the right end of Fig. 1. As the wheel does not reciprocate, this mechanism merely traverses the wheel head across the bed of the machine.

Another novel feature is found at the wheel head assembly. The spindle is driven from the rear by a short endless belt and the abrasive wheel makes contact with the work at the rear instead of the front. In this way

the loads on the ends of the spindle bearings are always in the same direction and the usual tendency to chatter and bell-mouth the ends of the hole in the work are eliminated.

By contacting the wheel with the back of the work at one end and driving the spindle from the back at the other end, a couple is set up and the essential slight clearance at the cross slide and spindle bearings does not affect the position of the wheel. For gaging or chucking, the table is moved to the outermost position by operation of the hand lever on the front of the machine. An unusual detail is the combined plug gage rest and wheel guard which is shown in the foreground of Fig. 1.

New Bearing Said to Eliminate Need for Reaming or Broaching

LINE reaming or broaching the crankshaft main bearings is claimed to be rendered unnecessary by a new bronze-backed, babbitt lined bearing known as the "close limit interchangeable" type, which has been developed and patented by the Federal Mogul Corp., Detroit, Mich. The elimination of this operation, which is made possible by the design of the bearing and by the close limits to which it is held in manufacture, results in important savings in both the engine manufacturing plant and the service station.

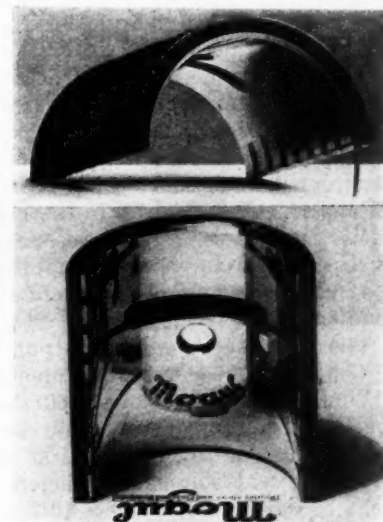
In the manufacture of the bearing, it is pressed or sprung into a slightly elliptical shape just before the splitting operation. In the latter operation, the cut is taken along the longer axis of the ellipse. As a result, the inside and outside diameters of the bearing at the split are from 0.004 to 0.005 in. greater than they would be if the halves were semicircular.

For the finishing operation the halves are held in a cylindrical fixture which exactly duplicates the bearing seats in the engine in which the bearing will be installed. This fixture temporarily springs the bearing back into a circular shape.

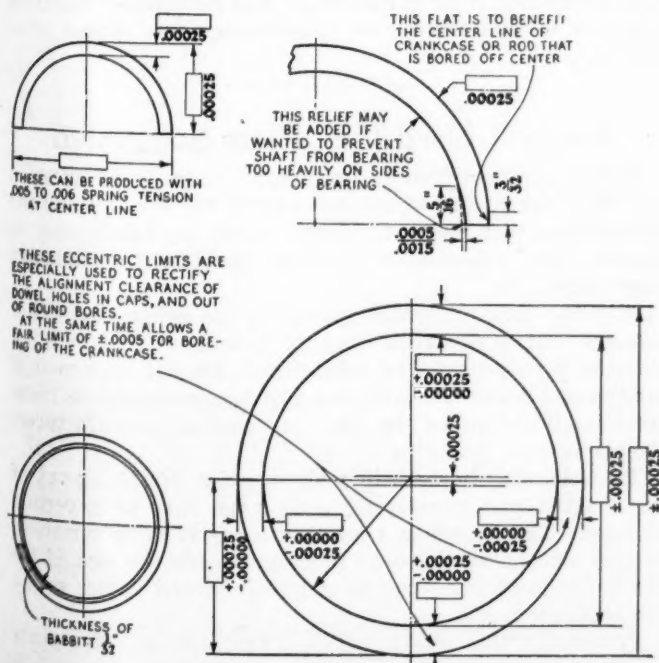
The next operation is the finish broaching of the hole. Considerable experimental work was necessary before the desired results were obtained here, but a broach was finally developed that gives the necessary accuracy and at the same time imparts a mirror-like finish that is said to be superior to that secured with a reamer. The finish cut is

extremely light. The broach is shaped to relieve the halves by from 0.0005 to 0.0015 in. at the split, so there will be no possibility of binding at this point.

The tolerance allowed on the inside and outside diameters, and on the wall thickness, is 0.00025 in. and, consequently, the inside and outside of the bearing are concentric within that limit. As a result of this accuracy,



Two views of the lined bearing which is claimed not to require reaming or broaching



the two halves make a practically oil-tight joint at the split when they are assembled in an engine.

When the bearing is installed, the upper half is pushed into its seat in the crankcase. The lower half is put into the bearing cap and secured with a dowel. No set screws are needed to hold the upper half, the lower half holding it securely in place when the cap is tightened. The crankshaft is then installed without any intermediate reaming or broaching operation. It is evident that the use of this bearing necessitates accurate machining of the crankcase and caps, for if the seats are out of line the bearings also will be out of line. However, the experience of several car manufacturers who are using this bearing in regular production indicates that the desired degree of accuracy can be obtained without any material increase in manufacturing costs.

The method of installing the bearing greatly simplifies the placement, as this work can be done without removing the crankshaft.

Replacement is possible because the upper half is not secured to the crankcase and because the accuracy of manufacture makes reaming or broaching unnecessary.

The bearings are interchangeable and, consequently, in reassembling it is not necessary to make sure that each bearing cap is replaced in the original position.



The FORUM



Letters From Some of Our Readers

Robert N. Janeway, engineer, General Motors Research Corp.,
K. P. Albridge, mechanical engineer, Durant Motors of Canada
and H. B. McDonnell write on subjects of current interest.

Editor, AUTOMOTIVE INDUSTRIES:

In reading the article on "Use of the Supercharger" by Mr. Heldt in AUTOMOTIVE INDUSTRIES for June 19, it occurred to me that several factors had possibly been overlooked in the calculation of power required for supercharging.

In the example taken, an engine of 183 cu. in. displacement was assumed running at 2500 r.p.m. and having a volumetric efficiency of 70 per cent at that speed. To find the supercharging pressure that would give atmospheric inlet pressure, the latter was divided by 0.7, assuming, apparently, that the total loss in volumetric efficiency is due to the pressure drop in the induction system. On this basis, the supercharging pressure was calculated to be 21 lb./sq. in., leaving 6.3 lb./sq. in. as the pressure drop in the induction system—obviously excessive, under the given conditions.

The increase in engine output was likewise figured on the basis of 100 per cent volumetric efficiency.

Would it not be more accurate to assume a value of fresh charge temperature, say 180 deg. Fahr. with a room temperature of 70 deg. Fahr., at which the intake pressure at 70 per cent volumetric efficiency would be

$$P = \frac{0.7 \times 640 \times 14.7}{530} = 12.4 \text{ lb./sq. in.}$$

Then the pressure drop in the induction system = $14.7 - 12.4 = 2.3$ lb./sq. in., and the supercharging pressure becomes $14.7 + 2.3 = 17$ lb./sq. in.

Assuming the same charge temperature, the volumetric efficiency is increased to

$$70 \times \frac{14.7}{12.4} = 82.8 \text{ per cent.}$$

The power absorbed in adiabatic compression is then, from the formula,

$$HP = \frac{3.463 \times 14.7 \times 144 \times 132 \times 0.828}{33,000} \left[\left(\frac{17}{14.7} \right)^{.29} - 1 \right]$$

= 1.04 hp.

Assuming 50 per cent efficiency of the supercharger,

$$HP = \frac{1.04}{0.5} = 2.08$$

Another factor involved that should not be neglected is the elimination of the pump loss with atmospheric inlet pressure. The power saved in this case would be

$$HP = \frac{2.3 \times 132 \times 144}{33,000} = 1.32.$$

The net power loss due to supercharging is thus

$$2.08 - 1.32 = 0.76 \text{ hp.}$$

The per cent gain in power under the above conditions

would be, approximately,

$$\left(\frac{82.8}{70} - 1 \right) 100 = 18.2 \text{ per cent.}$$

The actual gain in power on the basis of 2 cu. ft. of air per horsepower per minute is

$$132 \frac{(0.828 - 0.70)}{2} = 8.45$$

And the net gain is

$$8.45 - 0.76 = 7.69.$$

ROBERT N. JANEWAY,

Research Engineer, General Motors Research Corp.

Mr. Janeway is correct in that, owing to the preheating of the air or the heating of the charge in the manifold or in the cylinder, an inlet pressure equal to atmospheric does not correspond to a volumetric efficiency of 100 per cent, but to a lesser one. Hence, if an inlet pressure equal to atmospheric is made the limiting condition, the gain in power and the amount of power required to drive the supercharger are materially less than the results arrived at in the example in the article. It is evidently more rational to make an inlet pressure equal to atmospheric the limiting condition, rather than 100 per cent volumetric efficiency, for the reason that the latter condition cannot be approached in operation without the supercharger, and that difficulties from overheating and detonation might be expected if this degree of supercharge was aimed at.—EDITOR.

Radical Used Car Plan Suggested

Editor, AUTOMOTIVE INDUSTRIES: There is no question but what the future of the automobile revolves around the second-hand car market. Steps must be taken soon to master this problem or it will throttle the industry eventually.

Turning this proposition over in his mind, the writer can see but one logical way to overcome this evil. A clearing house should be established, headed by a man of exceptional ability. Said clearing house should be regulated and controlled by the automobile manufacturers themselves.

This clearing house will make a point of taking out of the market and destroying each year cars of a certain vintage. The length of time that a car is to be permitted to stay on the market—or in other words the age of the car to be destroyed—can be determined and values set by the clearing house.

Personally the writer believes that all cars five years

old or over should be taken out of the market.

Every automobile manufacturer would have to be a party to this clearing house, and would have to insist that each one of his dealers and distributors join in and each contribute a sum of money each year toward financing the removal of these cars.

The money expended would come back into the dealers' hands many fold, by the sale to the clearing house of cars which they themselves had on hand of the ancient vintage and by the sales prospects for hundreds of thousands of cars additional each year.

The amount to be contributed each year by the various automobile manufacturers, dealers and distributors would be set by the clearing house. The writer does not believe that this fee would be abnormal; in any case the automobile manufacturers themselves could stand a fair percentage of this expense, making it as easy as possible for the dealer and distributor, as the additional increase in business to the factories would warrant the setting aside of a sum of money each year to take care of this.

The removal of stocks of antique service parts from the shelves of all concerned would help to hold down the excessive carrying charges, and in turn prevent the future owners of these obsolete cars from standing the burden of excessive repair charges. This in turn all helps to insure pleasant relations with car owners, who in turn are not going to have the grief that comes with running older cars, which give corresponding trouble with age, as they will be dealing only with late models. Hence drivers will be better satisfied.

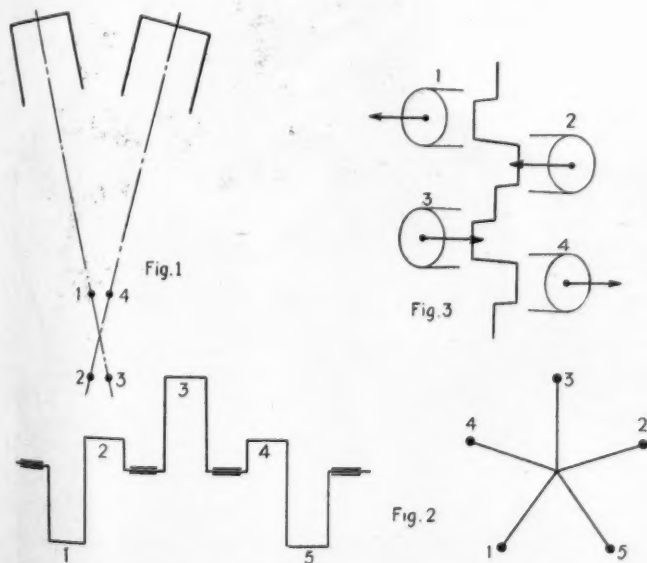
This is somewhat of a colossal undertaking, but some plan revolving around this might be worked out.

K. P. ALBRIDGE,
Mechanical Engineer,
DURANT MOTORS OF CANADA, LIMITED.

Small Angle Four Cylinder Vee Engines

Editor, AUTOMOTIVE INDUSTRIES:

Are you sure that the statement made by P. M. Heldt in his article in your issue of Feb. 14 that a four-cylinder Vee engine with the crank arranged as shown in the sketch below (Fig. 1) would be in good dynamic balance? I will admit that there will be no primary unbalanced forces and that there will be no primary rocking



Diagrams illustrating letter on four cylinder Vee engine:

couple in the vertical plane, but will there not be a rocking couple (primary) in the horizontal plane?

If you want a real innovation in motors with fairly good inertia balance, why not use five cylinders in line as indicated below? (Fig. 2.)

PROSPECT PARK.

Answer—There will be a slight rocking couple in the horizontal plane, but this will be negligible. Assume that the pistons in cylinders 1 and 4 are at the top and cylinders 2 and 3 at the bottom of their stroke. The horizontal components of the inertia forces on the reciprocating masses in the four cylinders then will be as indicated in the sketch Fig. 3, and it is directly apparent that there must be a horizontal rocking couple, for after one-half a crankshaft revolution the direction of every horizontal component will be reversed. However, since the angle of Vee is made as small as possible and the horizontal component is determined by the sine of one-half this angle, it is very small indeed.

The five cylinder-in-line probably would be a good type, but most engineers would prefer the six in line which has more even torque and is in perfect balance so far as primary and secondary free forces and rocking couples are concerned.

Explaining a Registration Inconsistency

Editor, AUTOMOTIVE INDUSTRIES:

I note in your tables for automobile registration in the various States in the last number of AUTOMOTIVE INDUSTRIES that you do not explain the reason for the great falling off in registrations in the District of Columbia and Maryland. This is because of reciprocity that went into effect Jan. 1 of this year. Before that time we all had to carry two sets of tags and be registered in both jurisdictions if we drove in both. This would more than account for the percentage loss in registrations in D. C. and Md.

H. B. McDONNELL.

College Park, Md.

Results of Testing Steel Tubing

TECHNOLOGIC Paper No. 258 of the Bureau of Standards deals with the "Strength of Steel Tubing Under Combined Column and Transverse Loading, Including Tests of Columns and Beams," the author being Tom W. Greene.

The results arrived at by the experiments on which the bulletin is based show that there exists quite a wide deviation from straightness and wide variation in wall thickness in commercial tubing. Differences in wall thickness may cause variation in the area of two pieces of tubing of the same gage and diameter of 8 per cent, with corresponding variation of other properties. The data also show that stresses produced by eccentricities resulting from these variations are in some cases very high, and unless known and considered are liable to be dangerous. These variations should therefore preferably be limited to as narrow a range as possible in the specifications for commercial tubing and enforced by careful and rigid inspection.

The investigation was made at the request of the Bureau of Aeronautics, Navy Department, for the purpose of determining whether experimental data confirmed the approximate theory of struts subjected to combined axial and transverse forces or whether it would be necessary to devise new formulae.

Automatic Surface Grinder is Designed to Replace Milling

Williams, White and Co. develop single spindle, rotary design, surface grinder which is said to be automatic in every operation save loading and unloading. One operator for press and grinder.

IN the past the surfaces of the joints between the housings of automobile parts and their covers as a rule have been finished by milling, but it is claimed that this operation involves serious difficulties, the castings often being warped in the fixture or deflected under the pressure of the cutters, both of which result in an inaccurate surface.

Less pressure is said to be required to hold a piece for grinding than for milling and, besides, the cutting pressure of a grinding wheel is said to be considerably less than that of a milling cutter, under proper conditions. For this class of work, which includes the finishing of such automobile parts as transmission case covers, timing gear case covers and bell housings, Williams, White & Co. of Moline, Ill., have developed the Osterholm automatic surface grinder, a single spindle rotary design.

This new machine incorporates many of the features of the Osterholm plain automatic surface grinder and the Duplex rotary grinder described in a previous issue of this publication. It has been the designer's object to build a machine that would be automatic in every operation except the actual loading and unloading.

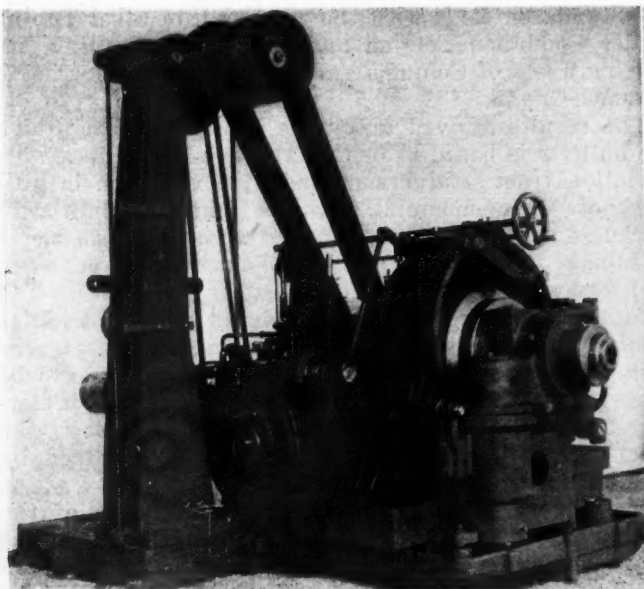
One of the illustrations shows the work-carrying spindle swung back on a vertical axis to the loading position, perpendicular to the face of the wheel. A timing

gear case cover is clamped in position in the fixture. With the work securely clamped in position, the operator swings the work-carrying spindle housing into an operating position.

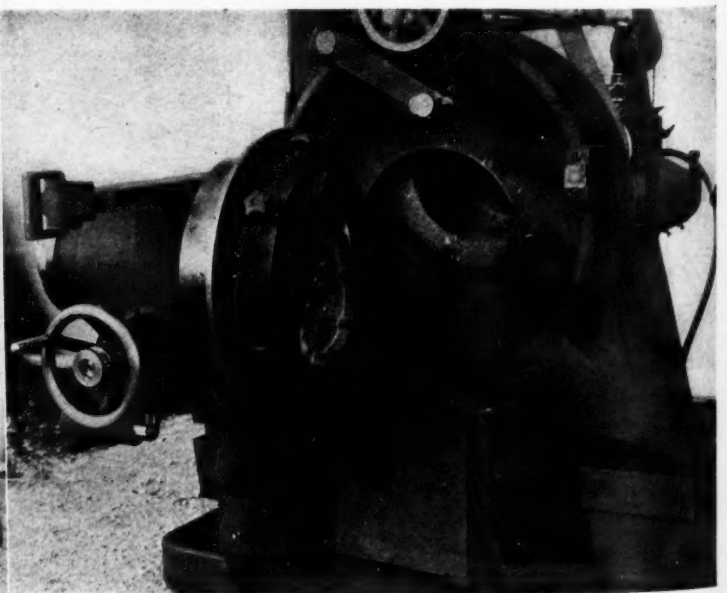
The housing is locked in this position by a mechanism similar to the breach lock used on large field guns. The engagement of a single lever then starts the machine on an automatic cycle. The work-carrying spindle is rotated, the feed of the wheel toward the work is applied, and the coolant is automatically fed through the spindle carrying the abrasive wheel. After the required amount of stock has been removed the feed automatically ceases and the work head comes to a stop. The work-carrying spindle is unlocked and returned to the loading position by a pulling motion.

The work-carrying spindle is carried in combination radial and thrust ball bearings. Spring buffers are provided at both ends of the 90 deg. motion of the work spindle housing, so that the weight on this part of the mechanism is cushioned at both ends of its rotation. Steel buttons are claimed to assure positive alignment of the work-carrying spindle with the grinding wheel when locked in its operating position.

A series of change gears on the left makes it possible to adjust the speed of the work head to the requirements



General view of the Osterholm automatic surface grinder, showing compactness of the machine



Work carrying spindle swung back 90 deg. on vertical axis to the loading position

of the piece to be ground. The driving mechanism for the work-carrying spindle is entirely inclosed and flooded with oil.

A hollow cylindrical wheel of 20 in. outside diameter, 6 in. face and 2 in. thickness of rim is mounted in the wheel chuck. The spindle, which is made hollow for the accommodation of the coolant supply pipe, is carried in two babbitt bearings driven by a 10-in. belt at 900 to 1000 r.p.m., a maximum of 30 hp. being required. The reaction or thrust of the wheel is taken on a ball thrust bearing. The means for adjusting the endwise play of the spindle is located at the rear of the spindle bearing. Both spindle bearings are of very liberal dimensions and are lubricated by chains running over them into oil reservoirs in base of spindle housing.

How Spindle Head Is Mounted

The spindle head is mounted on a slide and located by a screw and hand wheel adjustment. In production work the adjustment is used merely to locate the wheel and adjust for wheel wear. The outboard end of the adjusting screw is threaded into a pedestal operated by a single-tooth rack, which in turn is actuated by a feed cam to form the power feed. The sector which advances the rack is located on the cross shaft at the back of the machine. This cross shaft carries a large cam lever with an intermediate cushioning spring.

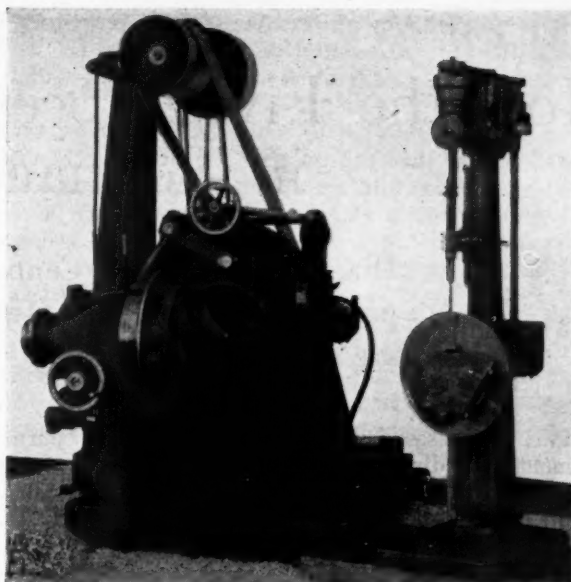
A roller at the long end of the cam lever engages with the feed cam which draws the wheel back $3/16$ in. during loading, then brings it up into working position, and finally establishes a constant rate of feed through any predetermined distance to the finished position. When the finished position is reached, the roller follower rides up the advance side of the cam peak, causing the feed lever to contact with a trip lever which shifts the feed belt to a loose pulley, thereby stopping the rotation of the work-carrying spindle. This belt drives a pulley which is located on one end of the worm shaft.

At the opposite or forward end of this worm shaft is located a set of change gears which transmits a drive to the worm shaft of the worm and gear combination that drives the feed cam shaft. An emergency jaw clutch is installed on the feed worm shaft, being operated by hand lever. When this lever is disengaged, the work-carrying spindle continues to rotate, but the wheel head ceases to advance. Varying rates of feed may be obtained by interchanging cams, although the manufacturer has devised an adjustable spiral cam for the same purpose.

Range of Working Time

Whereas the contour of the feed cam controls the depth of cut for a given operation, the time for a cycle of operations is determined by the ratio of the change gear set. The combinations which have been adopted permit a range of actual working time that varies from 10 seconds for small work to 2 minutes for heavier operations. Because of the relative length or ratio of the feed cam roller lever arm, profiling of the feed cam is a comparatively simple operation and need not be held to micrometric limits. As the reduction is great, a reasonable degree of accuracy at the profile of the feed cam produces very close results at the feed rack.

An unusual feature consists in the method of coolant control and circulation. In the first place the coolant is introduced through the center of the spindle by means of a long tube which projects through the hollow spindle and directs a stream of coolant against a deflector mounted just inside the cup wheel. The long tube is supported at the rear end by means of a hollow bracket to which the hose supplying the coolant is attached. The



Equipment for finishing gear case covers, comprising one automatic surface grinder and a single spindle vertical drill with a fixture on which the casing to be ground is locked for loading

front end of the tube is supported in an oilless bearing just within the front end of the spindle. The deflector against which the stream of coolant is directed diverts the stream into the inside of the cup wheel, from which point it cascades across the entire cutting surface as a result of the centrifugal force. Because of this feature cast iron pieces and tempered steel pieces which had been subjected to an unusually heavy cut have been observed to come off the machine with no apparent increase in temperature.

To facilitate loading, the supply of coolant is cut off by a selective valve which is operated by a lever mounted on the shaft at the rear of the machine. During the loading of the machine, the coolant stream is automatically diverted into the slush pans.

One of the cuts shows equipment recently furnished to a large automobile manufacturer for finishing gear case covers. The bosses cast in selected positions on the side of the gear case cover are spotted by means of a special fixture in a single spindle vertical drill. An accurate locking device insures uniform spacing of the holes. The casting thus prepared is placed in the simple holding fixture mounted on the work carrying spindle and the piece is gripped by the holes previously spotted in the drill press.

With the work securely clamped in place, the operator swings the work carrying spindle into position in front of the abrasive wheel and with the same motion locks it. The machine is started by means of a trip lever located within easy access of the operator. As the operations of the machine itself are automatic, the operator is free to place another casting in the fixture mounted on the drill press and prepare the casting for the subsequent grinding operation. The cycle is so timed that one operator can operate both the drill press and the grinder.

ELECTRIC resistance wires as used in heating elements or merely for absorbing electrical energy, are made in general from nickel, iron or copper, in binary or ternary combinations with manganese and chromium. All of these metals are comparatively cheap, are available in sufficient quantity for commercial production and resist oxidation satisfactorily over the range of temperature which limits their use.

How the Five Processes for Producing Castings in Permanent Molds Differ

Die, Slush, Cothias, Centrifugal and Permanent Mold castings properly so-called are often confused. Four of the processes are used for automobiles. Adapted to quantity production only.

FIVE processes for producing castings in permanent molds are discussed in a paper by Robert J. Anderson, metallurgist, and M. Edward Boyd, formerly assistant metallurgist of the Bureau of Mines Experiment Station at Pittsburgh, which was presented at the annual conference of the Institute of British Foundrymen at Newcastle. The five processes are the following: (1) Die casting; (2) slush casting; (3) Cothias casting; (4) centrifugal casting; and (5) permanent mold casting. In the trade the term die casting is often applied to permanent mold castings and the authors call attention to the impropriety of this usage. Following are brief descriptions of the five processes given in the paper, which latter deals at length only with permanent mold castings.

DIE CASTINGS.—A die casting is defined as a finished, or practically finished, casting made by forcing a liquid metal or alloy into a metallic mold or die. It is supposed that little or no machining other than drilling for screws, bolts, and the like, and removal of fins by dressing, will be required to put the casting into condition for use. Die castings are sometimes confused with die pressings, which are made by the hot pressing of metals and alloys, and die pressings are often referred to as die-pressed castings and die castings. A die casting is a *finished casting*, in the general meaning of the term, in contradistinction to a rough sand casting, for which a greater or lesser amount of machining is invariably presupposed. Emphasis should be directed to an essential item in the die casting process, which sharply distinguishes it from other processes involving metallic molds, viz., the alloy is forced into the die cavity by pressure; such pressure may be mechanical, as a plunger working in a cylinder, or air pressure.

Quantity Production Related to Costs

Die casting, as is the case with other processes involving metallic molds, is essentially a quantity production process, and but few parts can be considered practical die casting jobs in lots of less than 1000. This is necessarily so because of the heavy expense involved in designing and preparing the necessary dies; in small lots, the heavy die expense will be proportionately reflected in the cost of the castings. The cost of any die casting must normally be less than the cost of producing a sand casting plus the cost of machining to a finished casting equivalent to a die casting. The die casting process is employed commercially for tin-rich, zinc-rich, lead-rich and aluminum-rich alloys. Alloys of higher melting points, like the brasses and bronzes, can, of course, actually be die cast, but such alloys have so strong an erosive effect on ordinary die steels that the process is not commercial for these alloys. The life of a die when casting brass is exceedingly short, and at the present time the die casting process is confined to alloys of relatively low melting points. Die casting dies for aluminum alloy work are normally made of chrome-vanadium steel.

The die casting process is especially applicable to the production of small interchangeable parts which do not need to be especially strong and sound, but which are required to be well finished and accurate as to dimensions. The die casting process has been applied very extensively to the production of small parts for automotive construction, household appliances, radio apparatus, adding machine parts, cash register parts, and for many other purposes.

Slush Casting Defined

SLUSH CASTINGS.—A slush casting is defined as a practically finished casting made by pouring a liquid metal or alloy into a metallic mold, followed by immediately inverting the mold and thereby pouring out the excess unfrozen alloy in the center of the mass, thus leaving only the solid shell formed by the contour of the mold. Slush molds are made usually of brass or bronze, and zinc-rich and other low melting point alloys are employed for casting. The mold is usually mounted upon trunnions or otherwise arranged so that it may be rapidly inverted. The slush process is adapted for the production of certain types of hollow castings, but it is of no importance for making castings to be used in engineering construction. So far, the process has been confined to the production of vases, dolls, statues, figures, electroliers and fittings.

COTHIAS CASTING.—A Cothias casting is a finished, or semi-finished, casting made by first pouring a liquid alloy into a metallic mold and then forcing a top half of the mold containing the cores into the alloy while liquid, thereby giving internal shape to the casting. In the Cothias process the lower half of the mold, which conforms in shape to the outside shape of the required casting, is heated, and a measured amount of liquid alloy is poured in; the top half of the mold, conforming to the inside shape of the casting, is then forced into the bottom half in the manner of a stamping press, thus forcing the alloy into the shape of the required casting. The plunger acts as the core. The process is adapted to fairly large castings in fairly low melting point alloys, e.g., aluminum alloys, where good surface finish and good mechanical properties are required. It is used largely for thin walled castings of more or less open shape, and it is not applicable to complicated box castings with inside cores. Simple crankcases, transmission cases, cylinders and pistons for automotive construction are made in England by this process in aluminum alloys.

CENTRIFUGAL CASTING.—A centrifugal casting is a finished, or semi-finished, casting made by pouring liquid alloy into a rotatable permanent mold, followed by rapidly rotating the mold so that the alloy is forced to the walls of the mold. In the process centrifugal casting machines are used, and these are extremely simple in design, consisting merely of a mold rotatable at high speed and a spout to supply the alloy.

Molds may be rotated on horizontal, vertical or inclined axes. Molds may be made of cast iron or alloy steel, and they may also be made of cast iron lined with clay; they may be run warm, hot or water cooled. The warm mold, by which is meant a mold which does not become especially hot and is neither heated by special burners nor water cooled, was the first development.

Water cooled molds, as in the De Lavaud machine, have been used for making cast iron pipe, while the hot mold, which permits the casting of quite thin sections, has been developed recently by Cammen. Special high-chromium steel is used for hot molds.

Practically any cylindrically shaped body can be made by centrifugal casting, and the process has been applied commercially to the production of pipe, railway truck wheels, propeller sleeves, paper mill rolls, tubes and other

parts. While the centrifugal casting of alloys is an old process, it did not assume much importance until about 1914. It has been used for both ferrous and non-ferrous alloys.

PERMANENT MOLD CASTING.—A permanent mold casting is defined as a finished, or semi-finished, casting made by pouring a liquid alloy into a metallic mold, the alloy entering the mold and filling the cavity under the force of gravity solely. The process is the counterpart of sand casting, the only difference being in the nature of the mold. The terms "hand poured die castings" and "gravity run die castings" have been applied to the products obtained by permanent mold casting, but these terms are quite unnecessary. By definition, the permanent mold process can be very readily distinguished from other processes involving the use of metallic molds.

Four Models in New Line of Two-Ton Trucks Brought Out

THE Gramm-Bernstein Truck Corp., Lima, Ohio, has brought out a new line of 4000-lb. capacity trucks consisting of four models which are designated as 65, 66, 67 and 68 respectively. Model 65 has a 138-in. wheelbase and measures 120 in. back of the driver's seat. The corresponding dimensions for Model 66 are 150 and 144 in. Model 67 has the same wheelbase as 65 but is designed particularly for a dump body. The fourth model is a tractor chassis, with a 112-in. wheelbase. Mechanically the various models are the same except for the changes made necessary by the difference in the wheelbase lengths.

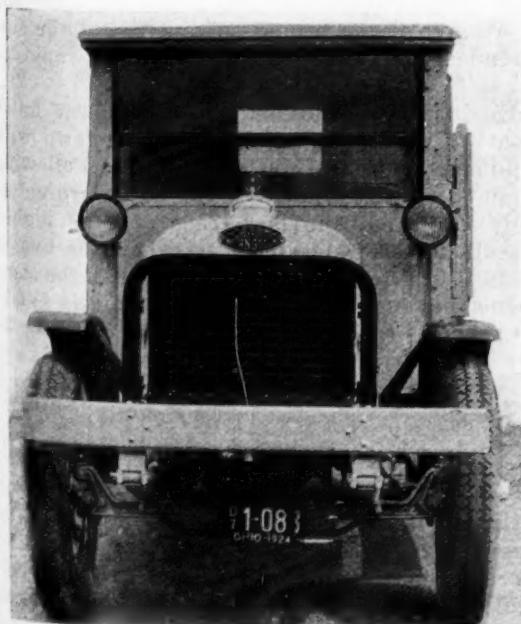
The engine used is a four-cylinder, L-head type with 3¼-in. bore and 5-in. stroke. Cooling water is circulated by pump and oil is supplied to all main and connecting rod bearings under pressure. Battery ignition is regular equipment. The carburetor is a 1-in. Stromberg and is fed by gravity from the tank on the dash.

The drive is taken through a dry-disk clutch to a three-speed, constant mesh, jaw clutch type gearset providing ratios of 3.6 to 1 in low, 1.89 to 1 in second, direct in

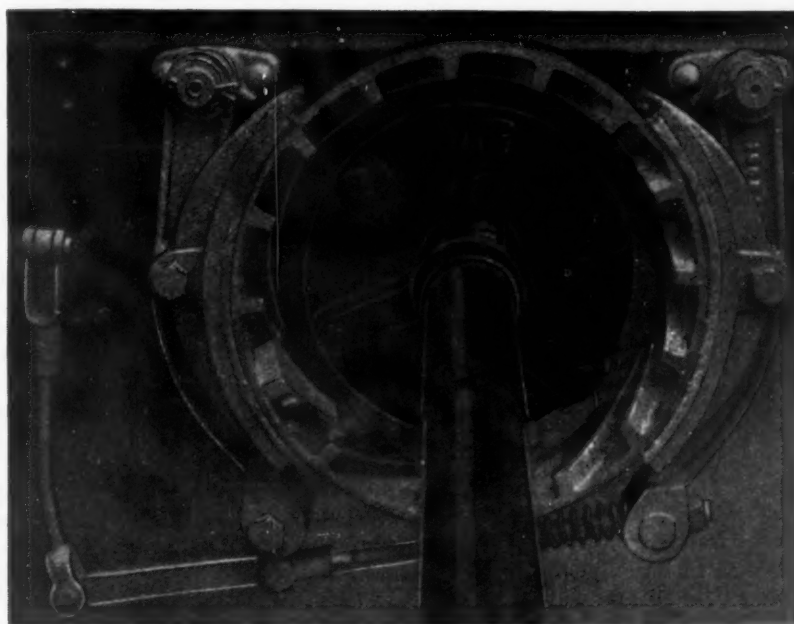
third, and 3.73 to 1 in reverse. The propeller shaft is fitted with two fabric disk universals. The rear axle is a worm type and is offered in either of two reductions, 7.8 to 1 and 9.66 to 1. Torque and thrust are taken through the springs.

The service brake is of the contracting type, operating on the transmission. The emergency brake acts internally on drums on the rear wheels. Semi-elliptic springs are used all around, those in front being 40 in. long and 2¼ in. wide, while those in the rear are 52 by 2½ in. The frame is a semi-flexible design with channel section side members 5 in. deep with 2½ in. flanges. Wood wheels are regular equipment, but steel may be had at additional cost. The tires sizes are 36 x 4 in. and 36 x 6 in. solids and 35 x 5 and 38 x 7 in. pneumatics. The steering gear is a cam and lever type.

Regular equipment includes front bumper, ventilated windshield and fully enclosed cab, electric lighting system including generator and battery, horn, hub odometer and Alemite lubrication. Model 65 is priced at \$2,550.



Front view, showing bumper, radiator guard, headlamps and ventilating windshield



Service brake of Gramm-Bernstein truck with cooling fins on inside of drum

All Seven Coats of New Pyroxylin Finish Applied in Two Days

Valentine to market line of nitrocellulose automobile finishes which they have been developing and testing for several years. Gives extreme durability. Two coats of varnish add high luster.

By Herbert Chase

VALENTINE & CO., well known in the automotive industry for the production of high grade automobile finishing materials, especially varnishes, have just announced the addition to their line of a group of nitrocellulose finishing materials for use in what is termed the "Valenite" system of automobile finishing. This system contemplates the use of pyroxylin base materials from primer to finishing enamel and is the outgrowth of development work with this class of material covering a period of about seven years.

The system is particularly well adapted to production work, since it is possible to apply the entire seven coats without artificial drying in two days' time and still produce a finish which is said to be one of the most durable which modern scientific methods have been able to give the industry.

In common with other pyroxylin finishes, the Valenite system produces a dull egg-shell luster, which can, however, be polished to a high luster if desired. It is recognized that such a polish does not give a depth and fullness attained with a varnish finish and if this type of finish is desired it is recommended that two coats of highly elastic finishing varnish be added. These coats are preferably the same final coats used in the "Valentine Super-System" described several weeks ago in these columns.

Durability Important Factor

With the addition of these coats the Valenite system is claimed to be the most durable non-baking high luster finish which it is possible to secure in the present state of the art. Such a finish, according to engineers of the Valentine company, will afford at least two years of hard service and, in the case of a car which is driven about 5000 miles a year and given reasonable care, should give four or five years' service.

Valenite materials are to be manufactured in a new plant located in Kearny, N. J., and will be ready for delivery in time for fall production. This plant has a floor space of 50,000 sq. ft., tankage 750,000 gal. and will be equipped with all necessary manufacturing and laboratory facilities.

While Valenite enamel used in the three final coats of the Valenite system can, if desired, be applied over undercoats such as are used in ordinary varnish systems, providing these undercoats are baked sufficiently hard, it is recommended that Valenite primer and surfacer coats be employed. These have a nitrocellulose base and not only require no artificial drying but have proved to be superior in themselves to the best varnish base primer and surfacer made by the Valentine company.

The typical schedule for the Valenite system calls for the application of one primer and three surfacer coats

the first day. The primer is air dried at 75 deg. Fahr. one-half hour and the surface coats one hour each. A Valenite spot putty also can be employed if surface irregularities require its use. These coats are allowed to stand over night and the following morning are water sanded to a velvety smooth surface.

Unlike ordinary sanding surfacers, Valenite surfacers absorb practically no water, so that, as soon as the surface moisture has dried off, the three coats of Valenite enamel can be applied, one hour of air-drying at normal temperatures being allowed between each coat.

Immersion tests of Valenite surfacers are reported to have shown that they absorb less than 3 per cent as much water as surfacers of the ordinary type. Consequently the time required for evaporation of moisture is greatly reduced and no artificial drying is required after the water sanding operation.

Can Be Polished

Valenite enamel, in common with other enamels, carries a finely ground pigment which gives the desired color to the finished product. The pigment helps to exclude ultra-violet light rays and thus adds to the durability of the finish, although it detracts from gloss, the pigmentation resulting in a matt or egg shell surface. This, however, can be polished on the day following application of the final coats. A special Valenite polish with which it is possible to develop a very high luster is to be marketed. This polish contains a fine abrasive and a sufficient amount of the proper solvent to cut the surface and render the polishing operation as rapid as feasible.

When varnish is to be applied over a Valenite finish the final coat of Valenite enamel is rubbed down with water and pumice after it is thoroughly dry. Following this operation the job is allowed to air dry overnight to be absolutely sure that the last traces of the higher boiling solvents have evaporated. (An hour or two in an oven at 120 to 125 deg. Fahr. will accomplish the same results.) One coat of Valentine's Motor Chassis finishing varnish is then brushed on. This is air dried for 24 hr. and then force dried at 125 deg. Fahr. for the same length of time, after which it is polish rubbed, using a mixture of fine pumice stone and rottenstone.

Eight Days with Varnish Coats

The final operation consists of brush or flowcoating with Valentine's HB V. A. V. finishing varnish, which is dried in the same manner and for the same time as the preceding coat. The total time required for this combined Valenite and "Super" system finish is approximately eight days, including final drying.

According to Valentine engineers, a single coat of varnish over any hard and relatively inelastic surface is

likely to peel off due to the fact that the film is so thin that it is unable to compensate for its expansion and contraction over the inelastic surface, even though the film itself is highly elastic. For this reason two coats giving a thicker film are recommended and give long life providing they are properly balanced in elasticity.

While it is recognized that the proper degree of elasticity is necessary in the various coats of finishing material used in any system of finishing, it is known that all nitrocellulose base finishes are much less elastic than good varnish finishes. A film of "straight" or unadulterated pyroxylin is quite inelastic and not at all suited for an automotive finish, consequently all such materials are mixed with suitable "fixed" or non-oxidizing oils, such as castor oil, in which are dissolved gums similar to those used in varnish manufacture. The oils give elasticity or plasticity and the gums hardness. The character and amount of each of the ingredients is important, but, as in varnish manufacture, much depends upon the heat treatment and method of combining the ingredients.

Tests of Pyroxylin Finish

According to L. V. Pulsifer, who was largely responsible for developing the Kauri reduction test, which now is the accepted standard for determining the relative elasticity of varnish films, no similar test has been developed as yet for nitrocellulose finishes, but the Valenite finishes have been developed in the laboratory by making tests, especially on sheet metal panels which are bent periodically over a given radius, after artificial drying. This gives a means of determining how well the finish adheres to the surface and resists flexing without chipping or cracking.

By the use of these methods, in common with exposure and other more or less standard test procedures, it has

become possible to select the most satisfactory pyroxylin and other materials and to develop finishes which are said to be much superior to products produced without similar development work. Incidentally some of the materials, notably the surfacer, have been found to be much superior even to the best varnish type materials which years of experience backed by careful research work in the Valentine laboratories had been able to produce.

All of the Valenite nitrocellulose materials referred to above are intended for spraying. To them may be added a Valenite striping color applied with the usual "striping pencil" and clear Valenite lacquer, the latter intended for finishing garnish rails and other natural wood parts, such as spokes. The clear lacquer, while much less resistant to the action of sunlight than pigmented enamel, is said to be unharmed by moisture which enters the wood via screw holes and the like and soon ruins some of the clear lacquers marketed to date. It is said to possess durability equal to the best grade of spar varnish.

In common with other nitrocellulose finishes, Valenite forms a hard surface which is not easily scratched. Varnish applied over a Valenite enamel surface can be removed by solvents which do not affect the cellulose base material. This makes it possible to revarnish a car on which the varnish film has cracked after prolonged use, providing, of course, the undercoats are in serviceable condition.

Valenite enamels are available in several standard production colors at a cost no greater than the best grade of varnish finishes.

Valenite primer is furnished ready for use while the surfacer takes an equal volume of Valenite thinner and the enamels take 50 per cent of thinner.

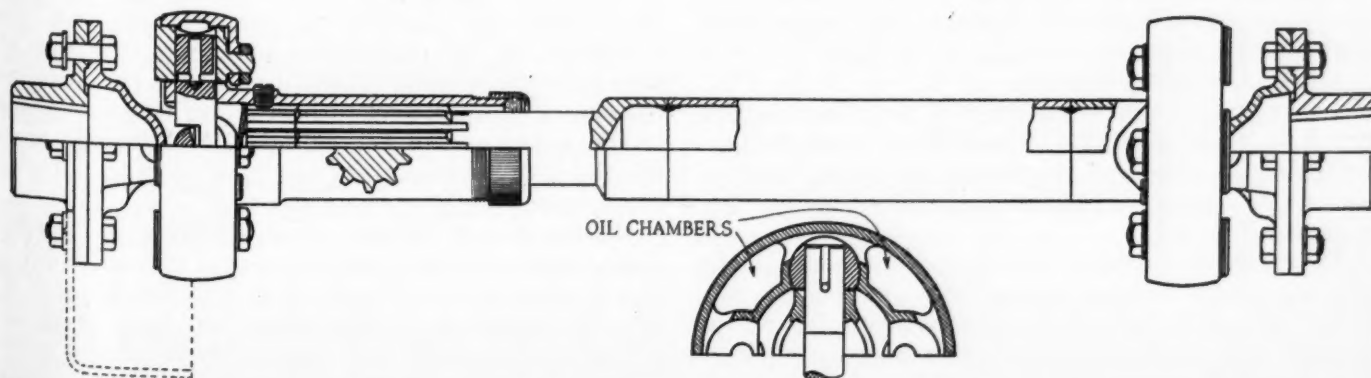
Almetal Universal Joint Which Contains an Oil Housing

THE Almetal universal joint, manufactured by the Universal Drive Shaft Co., Cleveland, Ohio, of which sectioned views are shown herewith, is of the oil-lubrication type and is claimed to hold its lubricant for a long mileage. The ring member of the joint forms an oil housing which is filled through a plugged filler hole, which makes it convenient to lubricate.

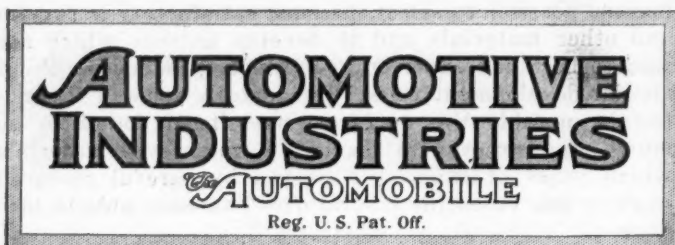
Concave spring steel washers are placed between the ends of the bearings and of the yokes; these washers are under pressure when the joint is first assembled and take up wear up to 1/32 in. In this way the chatter or

rattle which is a common feature of old universal joints is said to be eliminated. Should these washers wear in service they can be replaced at very little expense. The bearing pins can also be readily removed and replaced, thus avoiding the expense of having to replace the whole yoke.

The splined joints of these universals are of the involute type, with a 20 deg. pressure angle, which are claimed to be self-centering and to bear on all ten sides. It is recommended by the manufacturers that both the joint and the spline be lubricated every 5000 miles.



Universal joint which is said to need lubricating every 5000 miles only



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Silver Jubilee

TWENTY-FIVE years have passed since the automotive industry first became an integral part of America's industrial community. With the coming of 1925, the industry will celebrate its phenomenal progress with the Silver Jubilee.

Three of the automotive publications of the United Publishers Corporation will go into their twenty-fifth year at the same time as does the industry itself. *Motor Age* began its existence on Sept. 12, 1899. *Automobile Trade Journal* made its first appearance in October of the same year and *Motor World* entered the field in October, 1900.

Throughout a quarter-century of rapid automotive progress these business papers have recorded developments, suggested improved methods, charted new paths and served the industry in a constructive, permanent way.

To commemorate the twenty-fifth birthday of the industry the Silver Anniversary issue of the *Automobile Trade Journal* will be published in December. It will contain an interesting record of automotive progress during the past two decades and will point the way to further constructive achievement.

Three Ways of Lessening Dilution

NOW that crankcase dilution is getting to be a serious difficulty it is well to investigate any proposed remedy with respect to its effectiveness as well as with regard to any new troubles its application may carry in its train.

In one of the papers presented at the summer meeting of the S. A. E. details were given of some experiments in which all of the air drawn in by the carburetor was passed through the crankcase, with a view to causing it to absorb any fuel vapors or liquid particles that might get by the pistons and thus cause dilution.

In a somewhat different form this plan of returning fuel entering the crankcase to the combustion chamber has been used on stationary engines for years. In this case the carburetor air is not drawn through the crankcase, but the breather opening of the crankcase communicates with the air inlet to the carburetor, a sort of injector action being produced by the inrushing air which, in conjunction with the overpressure produced in the crankcase by any leakage of gases by the pistons, will cause a continued flow from the crankcase into the inlet system.

That crankcase dilution can be diminished in this way admits of no doubt. The tests recorded in the S. A. E. paper show very little dilution after several hours' running when all of the carburetor air was taken through the crankcase, whereas if the air was drawn in the usual way and the engine was run under otherwise the same conditions for the same length of time, the viscosity of the crankcase oil dropped from about 430 seconds to 350 or less.

Owing to the fact that the crankcase is constantly filled with a mist of oil, some of this oil would be drawn off to the cylinders whether the crankcase merely communicates with the inlet system or all of the carburetor air is drawn through the crankcase. Of course, in the latter case the transference of oil would be much greater. This might prove objectionable because of a smoky exhaust resulting therefrom or because the oil consumption was excessive.

Oil entering the combustion chamber with the combustible charge is not completely lost but may produce a beneficial effect in aiding the lubrication of the cylinder walls, valve stem guides, etc. When two stroke cycle engines were used on automobiles their lubrication was sometimes effected by mixing lubricating oil with the fuel in a certain proportion. If it were found that considerable oil passed over from the crankcase to the combustion chambers, the rate at which the oil is being splashed up in the crankcase or thrown off from the crankshaft might be reduced, for if the upper end of the cylinder is lubricated from the top it is not necessary to throw so much oil onto the cylinder walls at the lower end.

If the system should prove effective in keeping down dilution a moderate increase in oil consumption would be no serious objection, as with decreased dilution the crankcase supply would not have to be renewed so frequently and this probably would more than make up for the more rapid loss of oil.

In addition to the two systems described, in one of

which the crankcase is merely placed in communication with the inlet manifold, while in the other all of the carbureter air is drawn through the crankcase, there is a third possible system, in which a fraction of the carbureter air is drawn through the case while the rest is taken in directly.

The systems would seem to offer enough possibilities to merit a thorough tryout on automobile engines. Of course it would not be sufficient to merely make the connection from the crankcase breather to the carbureter air intake, but the lubrication system would have to be closely adjusted to the new conditions.

Colored Tops

PRACTICALLY all closed cars on the market today have superstructures finished in black. Even those concerns which have striven to secure individuality for their product by painting the body of the car in attractive colors continue, in most cases, to finish parts above the belt line entirely in black. This gives a two-color effect for the body as whole, but does not provide with as much distinctiveness as might be attained.

At importers and other salons in which high grade custom bodies are exhibited there are invariably a number of cars with colored superstructures that are much admired by discriminating critics. Often the upper part of the body is finished in a darker tone or color than the body panels and in some cases a touch of bright color is added around the windows or in a narrow belt just under them.

By following a somewhat similar plan large producers might attain something out of the ordinary at relatively small expense, while a car so finished soon would receive popular recognition as being different from the general run of modern closed cars.

In this connection it should not be forgotten that durable and very pleasing roof covering fabrics are available in many colors, so that a selection of a color which will match or harmonize with the colored superstructure and body proper is a simple matter.

Drive the Other Fellow's Car

IT often is said of engineers, with at least a degree of truth, that they fail to get the user's viewpoint because they drive cars of their own design too little and then seldom under the trying circumstances which confront average users when conditions are adverse. Too frequently, also, such difficulties as are encountered are remedied quickly by experienced mechanics who simply regard them as part of the day's work without considering how much trouble they will give the user before the troubles even are diagnosed.

It is almost as important, however, that engineers should learn the good points of competitors' cars as it is that he should learn and correct the faults in his own. For this reason he will do well to grasp every opportunity to drive cars other than his own as frequently and as far as conditions permit, for only by so doing can he fully appreciate advances in the art which are being made elsewhere.

Faults which are apparent in a competitor's car may well point the way also to similar faults in the car with which they are compared, especially when these are more pronounced in one than in the other.

Much would be gained also if engineers would discuss frankly the advantages as well as the disadvantages which they find in each others' products. This is done to some extent in S. A. E. meetings, but the process could be followed to advantage more frequently. We predict that a most interesting meeting would result, for example, if a dozen engineers in several automotive centers would swap cars for a week or more and then get together and discuss in a frank and unprejudiced way the lessons, favorable and adverse, which they learn as a result of the interchange. Why not try it?

Some things one engineer learned recently from driving the other fellow's car are:

- 1—That some hand brakes are not at all reliable.
 - 2—A tail light which gives some real illumination to the rear when the gear is in reverse position is worth a lot.
 - 3—A certain coupe has a nasty fore and aft pitching period which is absent in other body models on the same chassis.
 - 4—Steering is too hard and some violent shocks, probably the result of shimmying, are transmitted to the steering wheel.
 - 5—Four-wheel brakes gave no trouble, but were somewhat hard to apply.
 - 6—Windshield design leaves much to be desired from the standpoint of good ventilation, ease of adjustment, rain exclusion and clear vision.
- Most of these things were not new in the experience of this engineer, but they are just the sort of thing he could profit by when he drives the other fellow's car.

Hand Brakes

FOOT brakes which operate on the wheels or propeller shaft drums have been improved greatly on many cars within the past year, but hand brakes on the average car still leave much to be desired. On some cars the hand brake scarcely is capable of locking the car on a slight grade and is practically useless in checking the speed of the car when used alone or as an emergency substitute for the foot brake. This defect is not confined to the cheaper cars.

Not only are hand brakes generally ineffective but often they are hard to apply and release. Teeth in the ratchet are too coarse and in some instances neither the teeth nor the pawls are properly hardened. We have known of cases in which a hand brake set up hard could not be released at all by a woman driver.

Broken ratchet teeth are not uncommon, partly because a poorly designed brake system with centers of brake levers incorrectly located on the axle puts excessive strains on the brake rods when the brakes are set in going down a steep rutted hill. A double ratchet with fairly coarse staggered teeth and two pawls are used to good advantage in some cases.

Hand brakes should be true emergency brakes, ready for instant and effective use when required.

Our Industry Today—

Production in July Is Likely to Show an Increase Over the June Figure, Indicating That Stocks Are Moving Well

NEW YORK, July 28—Automobile manufacturers are anticipating more extensive operations than have been the rule for the last six weeks to meet what is expected to be a rather active demand in the fall. Such increases in schedules as may come, however, will be gradual.

There has been a better movement of warehoused stocks and cars in the hands of dealers during the last few weeks, with the result that dealers are now in a position to take on more cars than heretofore.

The actual retail demand will be the governing factor in operations during the rest of the summer, and the early part of the fall. From that time on manufacturers will gage their activities not only by the demand but by a conservative estimate of the outlook.

No marked spurt in sales the rest of the summer is expected to develop. There still continues much uncertainty among consumers as to the business outlook, and until this has been cleared away no noticeable uptrend in retail business is looked for. Buying is expected to be steady, but reaching no high levels.

Rural Buying Power

Some producers report improved conditions in agricultural sections with indications that buying will become greater as the season advances, although not reaching any notable proportions until the fall. Commercial centers, as a rule, are backward in buying and offer little hope at this time of entering the market in stronger force until there has been some clarifying of the general business situation.

It is probable that July will show a greater number of automobiles produced than in June, which set the lowest mark in output in more than a year. The low figure for that month, however, was not surprising in view of the consistently high records maintained by the industry during previous months and the general decline in sales in all business lines. Should July production mount above that of June, it will indicate that dealers are finding that their stocks are in such condition as to warrant taking on more cars and that an encouraging tinge is lent to the outlook for sales.

The industry as a whole continues to feel that the last quarter of the year will be unusually active, making up for the let down experienced during the summer months. Conditions then will be more settled, prospects for cars will be in a more receptive mood to make purchases, farmers will be in a position to absorb more of the output than they have been for some time, and the industry will be preparing for the heavy buying which starts with the opening of the show season.

For the present sales are running along steadily, though not on a high level, and

production is keeping pace with that condition.

Detroit Expecting Heavy Fall Demand

Immediate Shipment Orders Causing Factories to Speed Up Car Production

DETROIT, July 28—Retail buying in many parts of the country is showing a tendency to speed up materially, according to reports received by factory executives, reports which in many instances are backed up by orders calling for immediate shipments of cars. As a result factory production is being gradually advanced and there is a certainty of increased operations throughout the third quarter at least.

The news from the farm districts of the country generally is very encouraging to executives and the hope is ex-

pressed that the farmer is at last going to be in position to resume his normal buying. With a return of a fair volume of farm buying, coupled with a steady sale in the industrial and business districts of the country, the industry will quickly get back on a normal production basis.

Nothing is being taken for granted, however, and meeting a heavy fall demand, if it comes, will be strictly a matter of the industry's ability to produce. Dealers seem to have materially reduced their stocks, many reporting empty warehouses, but there is no indication here of any factory intent toward restocking against a possible heavy fall demand. Shipments now going forward from factories are entirely at dealer request.

Several companies recently bringing out new models report orders booked several months ahead. Hudson-Essex this week increased its production schedule from 550 to 660 a day to meet business on its new balloon tire models. Rickenbacker reports its new eight and the continuing six-cylinder models sold through to Oct. 1.

Parts Shipments Increasing

Parts makers report increased shipping specifications from car makers for August, these being only conservative increases, however, and indicating the determination to confine operations to dealer requirements for immediate business.

In the midst of all the enthusiasm over the generally improved outlook there is a note of alarm over the possible effect of the failure of some of the weaker companies. Financial circles here report that there are several concerns which cannot exist more than 30 to 60 days unless something bordering on the miraculous happens. Within the industry the passing of these companies has been expected, but public announcement, it is feared, will be misinterpreted as indicating a general weakness in the automobile companies as a whole.

News of a strictly opposite nature tells of plans for the formation of several new companies to manufacture entirely new cars. Plans for at least one of these concerns is definitely under way, with a car fully developed and ready to undergo tests preliminary to manufacture. This company will be headed by a well known figure in the industry and will undertake a production schedule which would make up several times over the schedules of the several companies whose withdrawal from the ranks is expected.

In the meanwhile truck and bus business is showing steady increases. Manufacturers of buses are finding it difficult to keep up with demand, and parts makers are being urged to speed shipments to their customers.

FARMERS ENTERING ERA OF PROSPERITY

MOLINE, ILL., July 30—The effect of the rise in grain prices cannot be overestimated, according to Dr. W. E. Taylor of the agricultural department of Deere & Co., who predicts that farmers are entering upon an era of prosperity such as has been unknown to them since prices of their products were reduced after the war.

Increasing sales of farm implements, tractors and motive equipment are already indications of the farmer reaction to the course of events. Farmers have gone without needed tools for months because of the uncertain condition of the country's markets, he said, but are regaining confidence in the ultimate upward trend and replenishing their equipment.

Plants Showing Greater Activity

Chicago Discovers Trade "Picking Up"

August Should See Marked Improvement in Automotive Production in Middle West

CHICAGO, July 28—From various sources in this industrial district come reports of a noticeable toning up. The brace is by no means general, but it is well enough distributed to constitute what might be called an indication of a slowly but steadily gathering trend of improvement which later on may be expected to be more or less universal.

Where several weeks ago comments by factory representatives on the situation were almost invariably disappointing, there is a good sprinkling now reporting business as "somewhat better" or "picking up," and there is a stronger run of optimism in nearly all quarters.

Trade association secretaries find encouraging signs in both producing and distributing fields. Inquiries received by such executives suggest that unemployment in the automotive field has possibly reached its low level and that forces will be augmented by many factories from now on. It is possible that July will show an employment ratio in this State as low or lower than June's, but August should see a marked improvement, with output more than holding its own through that month.

Starting Up in August

August will see a number of plants in operation that were shut down for the larger part of June and July. It also will see enlarged forces at a few of the greater accessory factories. Following the resumption of operations by Kissel at Hartford, Wis., which is now hitting a pleasing pace considering the season and conditions, came the resumption of Auburn, at Auburn, Ind., which closed for inventory and which has returned to operations on full schedule. Auburn will have to step up, at least until it once more catches step with its dealers whose stocks are reported low and who are taking cars direct from factory to their customers. Of course, production of both Kissel and Auburn will be considerably greater in August than in either June or July.

Production of motor vehicles generally in this district will be somewhat higher in August than for any recently preceding month and there will be a month by month increase after that. The extent of output, to be sure, will depend upon consumer demand and the general outlook of the more immediate future and there will be no long-time campaigns.

There is a tendency in the industry to be sure-footed. The third quarter

around here might be expected to go down in history more as a period of readjustment than one of radical change, and it is popularly believed that the best business of the year will come toward the last of the third quarter and in the final three months.

Dealer stocks are lower than they have been for some time and dealers are in fairly good shape now for the handling of new models.

The Week in the Industry

It has been a busy week in the Ford organization. In addition to building the usual large number of automobiles, Ford actually has begun production of three accessory items, has changed his freight rate policy, and has set up a plan for standardizing Ford used car prices throughout Canada. The units with which Ford has entered the accessory business are a windshield wiper, a rear view mirror and a dash light.

The whole trend of the news shows that nearly every automotive event or problem is being scanned carefully from a business and merchandising angle. The two trade days planned for the New York and Chicago shows are causing widespread comment, most of which is favorable. The N. A. D. A. proposes to hold a series of 25 sales congresses in various parts of the country and is asking the N. A. C. C. to bear half of the expenses.

Another straight-eight has entered the field. Frontenac is going to build a car powered with an eight-in-line Burt single sleeve valve engine. The new car has been developed during the last year by Louis Chevrolet.

Two Cleveland automobile manufacturers are planning to add considerable warehouse space to their factories with the idea of carrying stocks of cars which the distributors cannot or do not desire to take. They believe that such action on the part of manufacturers will be necessary in the future. Which calls to mind the question as to whether it might not be more economical to utilize public warehouses for such storage rather than increase the brick-and-mortar overhead which already is ample in most cases.

The death of Alden L. McMurtry, one of the founder members of the S. A. E., has taken from the industry one of its best known and most highly respected personalities.

Slack in Cleveland but Outlook Good

At Least 10 Automotive Concerns Planning on Factory Expansions This Fall

CLEVELAND, July 28—Taken throughout the industry in the Cleveland district, the automobile business for the last week continued to move slowly. A special employment report on the conditions thus far in July shows that employment is about 25 per cent under that in the motor car and allied lines than it was for the same period of 1923.

This same investigation indicates that with but a few exceptions the plants of this district are letting as many department heads and executives as possible take their vacations at this time, the thought being to keep only such executives on hand as are necessary to the present limited operation, but having the men back on the job by the middle of August, ready to get into the harness for an active business this fall.

Plants Making Money

In spite of the present rather sluggish condition, the companies in the Cleveland district continue to report healthy financial conditions. There is scarcely a firm of importance connected with the automotive industry which has not either already declared semi-annual dividends or which does not show statements of a fair profit for the first half of 1924.

Contractors report that at present ten companies in this district, associated with the automobile field, are dickering for new floor space to be erected in the late fall or the early winter. The estimate of cost for this construction runs to over a million dollars, it is asserted.

The fact that the stronger firms are figuring on additional plant facilities is taken as evidence that they have confidence in the immediate future for their products, which range from passenger cars to axles.

In two cases the building additions are planned for storage facilities for completed or partly completed cars. These companies, whose names can not be used at this time, believe that the time has come when manufacturers will have to carry surplus stocks, rather than expecting distributors to do so on as large a scale as has been customary in the past.

Distributors say that while the demand for accessories, which are more or less standard, has been good, that there is but slight call for new devices which may be useful but not essential to the operation of passenger cars. In short, they find that people are watching their expenditures with a great deal of care.

Schwab Is Chairman of Six-Wheel Board

Company Markets Bus and Truck
as Sales Subsidiary of Ameri-
can Motor Body Corp.

PHILADELPHIA, July 28—Charles M. Schwab, already actively identified with the automotive industry through his interests in the Stutz Motor Car Co. of America and the Bethlehem Spark Plug Co., has accepted the chairmanship of the Six-Wheel Co. of this city, which is marketing six-wheel buses and trucks manufactured under license granted by the Goodyear Tire & Rubber Co.

The Six-Wheel Co. is a sales organization which is a subsidiary of the American Motor Body Corp. of this city, in which Mr. Schwab also is financially interested. The latter assembles the chassis partly from standard components and partly from units made in its own shops or for it by other concerns. The body, however, is built complete by the American Motor Body Corp. itself. A complete description of the six-wheel bus was published in *AUTOMOTIVE INDUSTRIES*, July 10.

In addition to Mr. Schwab the officers of the company include Rodney Day, president; J. B. Kilburn, treasurer, and Henry E. Mead, secretary. Ellis W. Templin is vice-president and Chester M. McCreery, chassis engineer. Both Mr. Templin and Mr. McCreery assisted in the development of the Goodyear bus by the Akron concern.

Accepting the chairmanship, Mr. Schwab outlined his views on highway transportation, declaring:

I have neither the intention nor the desire to engage in highway transportation. I have entered the automotive industry, however, in the field of large capacity passenger coaches and freight trucks, with the idea of providing a solution of the two outstanding problems of efficient and economical use of the highways by heavy motor vehicles.

If I did not feel that highway transportation as a complement of rail transportation fills a need that cannot be met in any other way, I would not enter this field. I do not regard the motor bus and heavy duty motor truck as competitors of the rail lines except in segregated instances.

Continental Reports Great Gain in Assets

DETROIT, July 31—Total assets of Continental Motors Corp. have grown from \$256,527 on May 31, 1908, to \$35,892,334 on April 30, 1924, a period of 16 years, reports Ross W. Judson, president, in a statement to stockholders accompanying dividend checks today in payment of the twenty-eighth cash dividend on the common stock of the company.

During the year ending May 31, 1908, total sales were \$182,000 as compared with sales for the year ending April 30, 1924, of \$30,000,000.

Further comparison by Mr. Judson of

ANOTHER RAILROAD ADOPTS TRUCK USE

NEW YORK, July 30—The Long Island Railroad has taken up the motor truck for the transfer of less-than-carload freight between the western terminals of its lines. Two trucks make daily round trips over the Whitestone and Port Washington branches of this division, carrying all package freight.

In the work between the Long Island City, Bushwick Avenue and Flatbush Avenue terminals, a truck in making one round trip daily saves shippers four days, as the transfer of goods between these points by rail requires five days.

The trucking is on trial for 90 days, following which the railroad will consider the extension of freight haulage by truck to other branches.

the position of the company at these two periods shows a gain in cash from \$14,707 in the early period to \$2,047,586. Inventories in 1908 were \$92,500 and \$8,200,222 in 1924. Real estate, buildings, machinery, tools and equipment investment had grown from \$122,333 to \$15,801,846.

In all this period, it is noted, the management of the company has remained practically the same and the company has confined its effort entirely upon engine production for automotive vehicles.

Luxor Taxicab Company Will Manufacture Car

FRAMINGHAM, MASS., July 26—The Luxor Cab Manufacturing Co., which took over the plant of the Bay State Automobile Co. some months ago, plans to produce a six-cylinder car to be known as the "Standish," selecting the name of the famous character of Colonial days, Myles Standish. New machinery has been installed and when work is completed on Bay State cars, the Luxor company will take over the additional space.

It is understood that the closed models will list at \$2,595 and open models at about \$2,100. Production of the "Standish" will not interfere with the output of Luxor taxicabs which have been built here since the company took over the plant.

Riley Syndicate Buys Factory of Winton Co.

CLEVELAND, July 28—A syndicate organized by Frank N. Riley has bought the plant of the Winton Co. on Berea Road. The consideration is said to have been \$500,000.

Through this deal the plant in which Winton cars have been built for years will pass out of the automobile industry, it being said that the new owners will use it for other purposes. The Winton engine plant is not included in the deal.

Frontenac to Build New Straight Eight

Has Been Developed by Louis
Chevrolet—Carries Burt Single
Sleeve Valve Engine

INDIANAPOLIS, July 28—Another straight eight enters the lists with the announcement by the Frontenac Motors Corp. of this city of its new eight-in-line with Burt single sleeve valve engine which has already passed the preliminary experimental stage. The first completed cars have been developed during the last year by Louis Chevrolet, chief engineer.

The new vehicle will not be a contender for mass production records but enters the lists of maximum quality custom-built standards. Its wheelbase is 140 in. and from radiator to rear bumper its specifications include many well known Chevrolet refinements and details.

The new Frontenac Motors Corp., though a year old, has kept its work on the new car closely guarded. The corporation bought patent rights to the Burt engine for a straight eight to be built in America.

The engines so far produced and put through severe tests on the speedway and road have come up to expectations, it is declared. It is planned by the company to start production about the first of the year with both open and closed models.

The power plant is an eight-in-line Burt sleeve valve engine with 3 in. bore and 5 in. stroke, with N. A. C. C. rating of 36.45 hp., to develop in excess of 80 hp. at 2600 r.p.m.

Lockheed hydraulic type four-wheel brakes are employed with an emergency and parking brake on the transmission. Wood, wire or disk wheels are optional with either 33x5 in. cords or balloons. The steering gear is a late type especially adapted to use with balloons. Springs are semi-elliptic front and rear, designed to be perfectly flat under load.

The front springs are 40 in. long and 2 in. wide, while the rear are 60 in. long with a width of 2½ in. Large diameter spring bolts contain oil reservoirs.

The company was incorporated during August, 1923, with E. L. Jacoby, president; Louis Chevrolet, vice-president and engineer, and C. A. Bates, secretary-treasurer.

Stutz Is Bringing Out New "Toursedan" Model

INDIANAPOLIS, July 28—A new Stutz Toursedan has been announced at a price only slightly in advance of the open models. The new body is custom built, there being no two bodies alike so far as painting, trimming and fittings are concerned. The body is mounted on the standard Stutz 6-92 chassis and is of the flush panel design with equipment of dome light, crank handle window regulators and one-piece full ventilating type windshield.

Tire Schedules Rise with Better Demand

Unexpected Upward Move Comes
—Industry in Akron Is Putting
on More Men Rapidly

AKRON, July 30.—A completely unexpected and, for this season of the year, almost unprecedented upward movement in the production of automobile tires is being registered in the Akron district and in almost every factory of importance in the State.

Three of the largest producers in this territory are adding men rapidly, while labor scouts are spending much time in Akron in an effort to obtain skilled rubber workers for factories outside of Akron.

The B. F. Goodrich Co., which operates its plant on an even keel basis, with little change in output due to seasons, has completed increasing its production to 20,000 tires a day after reducing its tickets to 18,000 a day several weeks ago. It was believed that this figure would stand during the remainder of the summer at least.

Goodyear Makes 25,000 Daily

The Firestone Tire & Rubber Co. has asked for more men, as has also the Goodyear Tire & Rubber Co. The Goodyear ticket will be well above 25,000 tires a day, while that of the Firestone plant will be about the same figure.

The Miller Rubber Co. was operating so close to capacity that very little increase is being made, while the General Tire & Rubber Co. is expanding operations to utilize the new production equipment which has been installed in the factory to increase output at least one-third.

At the Mason Tire & Rubber Co. it is reported that production has been increased to 5300 tires a day, of which 3500 are being produced at the Kent plant. Slight increases continue to be registered in this production, although the figure brings the daily output very close to present capacity.

From every section of Ohio come reports that the smaller makers of tires are increasing output with a startling rapidity following a period of reduced operations brought about by the tire price reductions of the beginning of July.

See Profitable Operations

Many of these smaller factories were confident that as soon as prices were reduced it would be necessary to close their doors either temporarily or permanently and were reducing schedules following the cut when suddenly a wholly unexpected volume of business overwhelmed them and they regained visions of operating their plants at a profit.

The business which has brought about this changed attitude of the entire in-

INVENTORIES DECLINE AMONG TIRE DEALERS

NEW YORK, July 28—A fair increase in sales and a general reduction in inventories are reported to the National Tire Dealers Association by its members as a result of the last questionnaire sent out.

A decrease of 4 per cent in the number of tires on hand over March is shown. According to the estimates made, the average number of tires on hand June 30 figured at approximately 385 casings and 460 tubes per dealer. The dealers say collections are about fair.

Industry for the present at least comes from every section of the country and from both dealers and manufacturers of automobiles. The dealer business in re-orders is the most surprising and in some quarters it is being doubted whether the inventory of completed tires in the hands of the dealers and the manufacturers, especially the former, was actually as large as nationwide surveys made early this summer would lead the industry to believe.

The largest part of the new business naturally arises from these re-orders, although renewed activity in the automobile producing centers is leading to a considerable volume of new business.

Price Cutting Not Discussed

For the time being at least the talk which was heard in widely separated places during the last few weeks of a new tire price cut has stopped almost entirely and has been replaced in other quarters by a discussion of the possibility of increases in the price schedules.

As a result also of the advancing in business activity during the week prospects for profits from production which were bright during the year thus far and especially so until price cuts were registered continue to grow greater.

The same officials who at the end of the first month following price cuts last year predicted dire results and no profits for the second half of the year due to price declines are optimistic at the present time and feel certain that the industry will make almost as much during the second half of the year as was registered during the first half.

Last year the profits for the 12 months were shown during the first six months, while the second half of the year was without net results for many of the Akron and out of Akron companies.

FORD SALES IN ITALY

DETROIT, July 28—The Ford Motor Co. of Italy has informed the home office that in the first five months of this year it has sold 149 per cent more cars, trucks and tractors than in the same period last year, deliveries totaling 2934. In tractors the demand has increased 321 per cent over last year.

Sees Bright Outlook Throughout Far East

Hudson Export Manager Back
Home After Visit to Australia
and Other Countries

DETROIT, July 28—Highly favorable conditions in Australia, New Zealand and the far eastern countries generally are reported by H. B. Phipps, export manager of the Hudson Motor Car Co., who has returned from a six months' trip in that part of the world.

The Australian market especially, and by that is included New Zealand, has been surprisingly large, said Mr. Phipps, and promises to continue very favorably through the balance of the year. Prices for wool and the large clip is mainly responsible for prosperous conditions in Australia resulting in good markets for automobiles and many other imports. Aside from wool, however, the country is getting good prices for all its products and has had good crops. Cattle raising is being supplanted to a large extent by sheep because of better markets for wool and mutton.

Prospects for a continuing good market for the established American automobile companies are excellent, said Mr. Phipps, though in view of the large business of the last two years it can hardly be expected to continue as heavy. There is little evidence of any dumping of cars, he said, for the reason that there is no one to dump them on. The automobile business of the country is in the hands of established dealers, and there is no opportunity for anyone to stampede the market.

Used Cars Not Big Problem

The ratio of ownership in Australia and New Zealand is now about one car to 40 inhabitants, said Mr. Phipps, a fairly high average in view of the high price of cars there. Retail selling involving trading of old cars is about 40 per cent of the total, he said, indicating that used cars are not the problem they are in the United States.

Java and Sumatra also showed greatly increased business, declared Mr. Phipps, with somewhat slower conditions in the Straits Settlements and in China. The Chinese market is still far from being ready to take cars in quantity, he said. In Japan conditions are unsettled, due to the political situation following the action by the United States on immigration and though not a large buyer of cars at any time, is a smaller buyer now than previously. Conditions in the Philippines and Hawaii are also very good.

CALLED TO ACT IN BUS MERGER

NEW YORK, July 28—A meeting of the stockholders of the Omnibus Corp. has been called for Aug. 5, when the merger of the Chicago and New York motor bus interests will be declared operative.

3 Accessory Items to Be Made by Ford

Company Will Manufacture Windshield Wiper, Rear View Mirror and Dash Light

DETROIT, July 29—The Ford Motor Co. is introducing this week three accessory items which it will manufacture and merchandise through its regular dealer organization. These are a windshield wiper, a rear view mirror and a dash light. The three items are standard equipment on the Ford sedan. As prepared for merchandising the items come in separate cartons bearing the Ford trademark.

The company plans do not contemplate the introduction of any other accessories at this time.

Plans for merchandising the Fordson tractor have been changed in so far as selling through city dealers is concerned. The plan will be somewhat similar to the policy now in effect on Lincoln business, certain city dealers being selected to push tractor sales and carry demonstrators. The other dealers will sell as in the case of Lincolns, but deliveries will be made through designated tractor dealers. The change does not affect sales in the rural districts.

The company is working on a plan to assist dealers in promoting used car sales, the feature of which will be to bring used Ford buyers to regular Ford dealers. Sales of used Fords through corner lot dealers takes business away from the legitimate dealers, and the experience of the company has been that such sales lead to dissatisfied buyers in many instances and injure the prestige of the car. By assisting in bringing a large part of this business to its dealers, it will have a generally corrective influence, the company believes.

Plans Made for Handling McCarrell Transmission

MILWAUKEE, WIS., July 30—The McCarrell Automotive Products Co., a Massachusetts corporation with principal offices in Fitchburg of that State, and operating offices for the present at 429 Kenwood Boulevard, Milwaukee, has been formed for handling the McCarrell transmission and later other automotive products.

The Warner Gear Co. of Muncie, Ind., has already been granted an exclusive license for the manufacture of the McCarrell transmission for resale, and negotiations are being conducted with several car manufacturers having gear and transmission plants for direct manufacture.

The officers of the new company are W. A. McCarrell, president; E. R. Smith, vice-president, and M. A. Coolidge, treasurer. Five hundred shares of preferred

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, July 30—The outstanding feature of the current business situation is the strength in prices of agricultural commodities, with the resulting improvement in the economic position of the farming groups. The more cheerful sentiment which has been evident for several weeks has been increased by actual gains in some lines of industry and trade.

Car loadings in the week ended July 12 numbered 910,415, comparing with 759,942 in the preceding week (a holiday week) and 1,019,800 in the corresponding period last year.

Production of crude petroleum during the week ended July 19 averaged 1,977,500 barrels a day, as compared with a daily average of 1,992,850 barrels in the preceding week and 2,255,950 barrels in the similar period a year ago. Prices of crude petroleum and refined products continue to decline.

Business failures reported by Bradstreet's for the week ended July 24 numbered 350, against 365 in the preceding week and 377 in the corresponding week last year.

Bank debits to individual accounts reported to the Federal Reserve Board for the week ended July 23 totaled \$9,410,000,000. This is 7 per cent less than the aggregate for the preceding week, but 10 per cent more than that for the similar period a year ago.

Fisher's index of wholesale commodity prices stood at 147.1 last week, comparing with 144.5 for the preceding week and 142.3 two weeks before. This represents a rise of nearly 3½ per cent in two weeks, and is the first important advance since the early part of February. Bradstreet's index of wholesale food prices was \$3.14 last week, as against \$3.17 in the preceding week and \$3.11 a year ago.

stock of \$100 par value and 1500 shares of common stock of no par value have been issued. No production facilities are planned at this time, as the chief purpose of the new company is the licensing and sales promotion of automotive products.

MARMON PRICES INCREASED

INDIANAPOLIS, July 31—A price increase of \$200 on Marmon open models and chassis has been announced by the Nordyke & Marmon Co. Prices on closed models will remain the same.

Trade Day Show Plan May Become General

Enthusiastic Reception Given It Leads to Talk of Adapting It to Local Displays

NEW YORK, July 28—So well received has been the plan to devote the first two days of the national shows to the trade exclusively that already there is talk of adapting it to the local show circuit. While there is a tendency to wait and see how the New York and Chicago experiments work out, it is more than certain that when the National Association of Automobile Show and Association Managers meet at Atlantic City on Aug. 7-8 this question will come up for discussion and probable action.

While the local shows would not afford the same mart for equipment manufacturers as will the national events, it is felt that a day devoted to the dealers exclusively would prove a paying investment, particularly in the case of such cities as Cleveland, Boston, Cincinnati, Minneapolis, Kansas City and others in that class. In such cases, it is figured, the show proper could open to the public in the evening, after a day given over for dealer conferences and inspection of new models of cars and accessories.

Innovation Commended

The innovation seems to have made a particular hit with the parts makers, for since Neal G. Adair, show manager of the Motor and Accessory Manufacturers Association, broadcast the information to members, he has received a literal flood of commendatory telegrams and letters from them. With few exceptions, all reactions have been favorable.

In the opinion of Mr. Adair, a general effort may be made to make the exhibits at the national shows of greater educational and informative value. Both the M. A. M. A. and the N. A. C. C. are planning to cooperate in laying special emphasis on the enhanced value of the exhibits because of the trade days.

McFarlan Prices Higher to Cover 4-Wheel Brakes

CONNERSVILLE, IND., July 28—The McFarlan Automobile Corp. has announced an advance of \$100 in the list price of all models of the new light six chassis brought out some months ago.

The increase is to cover the cost of four-wheel brakes which are now fitted as standard equipment on this chassis. There are no changes in either the specifications or prices on the "big six." The following shows the old and the new prices on the "light six."

	Old price	New price
3-Pass. roadster	\$2,500	\$2,600
5-Pass. phaeton	2,500	2,600
4-Pass. coupé	3,000	3,100
5-Pass. sedan	3,000	3,100

Men of the Industry and What They Are Doing

Du Pont Gives Hospital

Pierre S. du Pont, chairman of the board of the General Motors Corp., laid the cornerstone of the Lewes A. Mason Memorial Hospital on Monday, his gift to the town. It will cost \$800,000 to build the hospital, Mr. du Pont making the donation as a testimonial of the regard of the family for its chauffeur, Lewes Mason, who fell a victim to influenza after years of faithful service.

P. K. Hexter Resigns

P. K. Hexter, vice-president and sales director of the Selden Truck Corp., has tendered his resignation to the receiver of the Selden company, to take effect immediately. Mr. Hexter has no definite plans for the future.

Heller Heads Bower Roller Bearing

Illness of R. F. Bower, who has been inactive for the last year, has caused a change in the personnel of the Bower Roller Bearing Co. of Detroit. C. H. Heller, one of the original incorporators and secretary since the company's inception, being elected president. George W. Mearick has been named vice-president; Theodore C. Dye, secretary and treasurer; W. S. Bennett, assistant secretary, and E. M. Pratt, assistant treasurer.

Williamson Research Engineer

J. L. Williamson has joined the Fellows Gear Shaper Co. of Springfield, Vt., as research engineer. Mr. Williamson for eight years was in charge of gear design and research work in the railway motor department of the General Electric Co. at Schenectady, N. Y.

Walling an Assistant Comptroller

V. B. Walling, an industrial engineer formerly connected with the Auburn Automobile Co., has been named assistant comptroller of S. F. Bowser & Co., Fort Wayne, Ind., as another step in the reorganization of the company. Mr. Walling will be directly associated with W. A. Bersch, comptroller, and W. C. MacFarlane, also recently appointed assistant comptroller.

Governor Would Appoint Shaefer

Gov. Emmet F. Branch of Indiana states that he will recommend to the Indiana State Highway Commission the appointment of Harvey G. Shaefer, former vice-president of the Nordyke & Marmon Co., as head of the equipment division of the Indiana Highway Department. Up to the time of the recent reorganization of the Marmon company Mr. Shaefer was in charge of production and plants of the company. The equipment division of the highway department, which has a large general garage and repair plant in Indianapolis and

several smaller plants and stations throughout the State, is in entire charge of the 1000 and more vehicles of the department.

Forrest with Talbott Tire

Howard A. Forrest, formerly superintendent of the Mason Tire & Rubber Co. of Kent, Ohio, has been appointed superintendent of the Talbott Tire & Rubber Co., with factory located in Dayton, Ohio.

Simons to Move to New York

Guy O. Simons, Willys-Overland distributor for Michigan, with headquarters in Detroit, will move to New York and become Maxwell-Chrysler distributor in the Brooklyn and Long Island territory. He will open his new headquarters there on Aug. 1 as president of the Simons Sales Co. Because of the change, it is expected that the Willys-Overland company will open a factory branch in Detroit.

Amos Starts on Tour of Far East

Frank B. Amos of the export department of Dodge Brothers spent several days in Washington this week with officials of the Bureau of Foreign and Domestic Commerce, relative to export markets for automotive products prior to leaving for San Francisco, where he will start on a trip through the Far East. He will visit Hawaii, Japan, China, India and Australia.

Rowe Organizes Company

W. L. Rowe, for more than 10 years associated with General Motors and Durant interests in a manufacturing and supervisory capacity, has severed his connection with Durant Motors, Inc., to organize the firm of W. L. Rowe, Inc., which will be located in the Fisk Building, New York City. The organization will be special representative on several accessory and parts manufacturers.

V. G. Harper Visits Europe

V. George Harper, export manager of Victor Motors, Inc., has sailed from New York for Europe. He will visit dealers in England and in other countries who have purchased Victor trucks and others who have requested trucks which the company has not as yet been able to ship.

J. E. Smith in New Connection

J. E. Smith, manager of the Market Research Department of the Class Journal Co., has resigned to join the advertising staff of McCall's Magazine. Mr. Smith is attached to the Chicago office and will represent McCall's in Michigan and Indiana.

Drumpelmann Sells Business

W. J. Drumpelmann, who resigned as sales manager of Rickenbacker Motor Co. last year to become distributor for that car in Cleveland, has sold the Cleveland business to the factory, which will open a factory branch there on Aug. 1. Mr. Drumpelmann is one of the best known sales executives in the industry. Before becoming connected with the Rickenbacker company he had been assistant sales manager at Hudson Motor Car Co. and with the Chalmers company. He will take a short vacation, according to present plans, and will then announce a new factory connection.

Bull Returns from Europe

A. A. Bull, chief engineer of the Northway Motor & Manufacturing Co., a division of General Motors, has returned from a two months' trip to Europe.

Resignation of R. W. Stone

R. W. Stone has resigned as manager of the New York branch of Kearney & Trecker Corp. of Milwaukee. He is succeeded by W. P. Lotz.

Myers Elected Bank Director

Thomas B. Myers, vice-president and general manager of the Hamilton-Beach Mfg. Co., Racine, Wis., and assistant secretary of the Scovill Manufacturing Co., Waterbury, Conn., the parent company, has been elected a director of the Manufacturers National Bank of Racine.

Jemison on Agency's Staff

Dick Jemison, formerly advertising manager of the Oldfield Tire Co. and later with the United States Advertising Agency of Toledo, has joined the forces of Williams & Cunningham, in charge of media for that advertising agency.

Pittsburgh Plate Glass Develops "Mimax" Finish

NEWARK, N. J., July 30—A new system of pyroxylin automobile finishing has been announced by the Pittsburgh Plate Glass Co., one of whose paint and varnish manufacturing plants is located in this city.

In announcing this system, to be known as the "Mimax" system, the manufacturers state that there no longer is any question that pyroxylin finishes will replace varnish systems. The same statement indicates that, with the capacities of two factories, the Pittsburgh Plate Glass Co. is ready to meet volume demand.

"Mimax" finish is said to be the result of exhaustive research work in the laboratories of the makers and is understood to be similar in a general way to other pyroxylin finishes.

Safety Conference Due in November

Hoover Committee Reports Will Be Considered—Group Meet- ings at Atlantic City

ATLANTIC CITY, July 26—Further progress on the preliminary work of the National Conference on Street and Highway Safety, sponsored by Secretary of Commerce Hoover, was reported at meeting of the Committees on City Zoning and Planning, Traffic Control and Education held in this city this week.

It is expected that the final reports of the eight committees functioning under Col. A. B. Barber, of the Chamber of Commerce of the United States and director of the conference, will be completed by the middle of September and that they will be published the early part of October. Six weeks will be allowed for general study of the reports before the National Conference is held.

Uniform Practices Sought

The aim of the conference is to recommend uniform practices on all questions relating to street and highway safety and inasmuch as educating the public will play an important part in the recommendations as finally adopted it is likely that a national educational campaign will be organized to arouse the public to the need of their cooperation to bring about the ends desired. Such a campaign, in fact, was recommended by the Committee on City Traffic, a sub-committee of the Committee on Traffic Control.

As part of its report, the Committee on City Zoning and Planning will embody deductions drawn from replies to a questionnaire sent to 250 municipal officials. This questionnaire asks the extent to which the traffic problem has been studied in the various communities, what methods have been adopted to meet it and other data pertinent to the subject. Not a sufficient number of replies were received to this questionnaire at the time of the meeting of this committee on which to base a final report. The chairman of the committee is F. A. Delano of the Washington Federal City Committee and at the head of the work on the questionnaire is Morris Knowles, engineer, of Pittsburgh.

Brosseau Submits Report

The Committee on Traffic Control, of which Major Roy F. Britton, president of the Automobile Club of Missouri, is chairman, is one of the most important of the eight committees. Reports to its membership were submitted by A. J. Brosseau, chairman of the Committee on the Licensing of Drivers; F. E. Jack, vice-president of the Chicago Motor Club, on Rural Traffic and H. A. Rowe, chairman of the Committee on Prevention of Highway Accidents, American Railway Association, on Grade Crossings.

Much discussion arose during the read-

ing of Mr. Brosseau's report on the question of abandoning the licensing of drivers entirely. This question was left open and will come up for further discussion at subsequent meetings.

Three sub-committees on the Committee of Education, under the chairmanship of Prof. A. W. Whitney of the National Bureau of Casualty and Surety Underwriters, made reports. They covered the education of drivers by groups, of the public and of school children.

The reports of all the committees are still in the formative state and will not be whipped into final shape until further meetings have been held.

Shutter Patent Suits Settled Out of Court

CHICAGO, July 28—As a result of conferences in Chicago, it is announced that there has been a settlement of all patent suits between the Pines Winterfront Co. of Chicago and the Irving Engineering Sales Co. of Buffalo, both manufacturers of automatic shutter attachments for automobile radiators.

The settlement is said to mean abandonment of this field of production and distribution by the Irving company. The settlement also automatically disposes of five court actions, two of which were filed in Chicago, two in Cleveland, and one in Buffalo. Attorneys for Pines Winterfront have offered the following comment on the litigation.

The Irving Engineering Sales Co. and all of its officers and executives have been enjoined from infringement of the various patents covering the Winterfront, and, the Irving company, in partial settlement for past infringement, has assigned all of its automatic shutter patents to the Pines Winterfront Co.

In order that the Irving Engineering Sales Co. may liquidate its automatic shutter business it has been licensed by the Pines Winterfront Co. to finish up and dispose of a limited number of devices prior to March 1, 1925.

Pines directors have declared the regular quarterly dividend of 50 cents a share on class A stock payable Sept. 1 to stockholders of record Aug. 15.

Irving Engineering Statement

BUFFALO, July 28—The Irving Engineering Sales Co. has confirmed the settlement of the patent litigation with the Pines Winterfront Co. of Chicago. In a statement issued today, it says:

A settlement of the patent litigation between the Pines Winterfront Co. and the Irving Engineering Sales Co. has been made, whereby our production of automatic shutters is limited for this coming season to 25,000 to March 1, 1925. Our company also manufactures a manual controlled shutter.

HUPP SALES FOR SIX MONTHS

DETROIT, July 30—Hupp Motor Car Corp. sales for the first six months totaled 18,000 cars, with earnings placed at approximately \$600,000. This compares with 24,100 cars in the same period last year. For the full year of 1923, the company earned \$2,635,788 and its production totaled 38,729.

Credit Chief Factor in Sales in Poland

Germany Grasps Situation— American Agents Are Making Attempts to Meet It

WASHINGTON, July 28—Assistant Trade Commissioner Elbert Baldwin at Warsaw cables the Automotive Division that under the conditions of exhausted operating capital, the factor of credit has, in general, become the dominant consideration in the Poland territory.

He says German motor manufacturers are offering virtually open credit to reliable parties. Where good probability of a market in Poland for an American product has been established, attempts have been made to reconcile greater security to the American exporter with the necessities imposed upon the Polish agent by local conditions.

Opens Up Market

For instance, limited consignments have been made to Polish banks or to banks in neighboring countries such as Germany, Austria and Czechoslovakia. Such quantities have usually been limited strictly to introductory quantities until expansion has been found warranted. The agent, however, has thus been enabled to draw upon virtually spot goods for cash. While in some cases the practice has led to no development, in others a market of value has been opened up.

With automotive trade for the first quarter considerably hampered, Assistant Trade Commissioner Charles E. Dickerson, Jr., at Athens cables the Commerce Department that the outlook for the second quarter in Greece is considered good, in spite of the political uncertainty and the tendency of the dealers to be rather reserved at present. Internal political conditions and doubt as to the probable effects of the situation on the exchange value of the drachma during the coming months are given as reasons for the lull in the first quarter.

Conditions in Vienna

Strict enforcement of import prohibitions by the Austrian Government, causing little change in the automotive market during the past quarter is noted by Trade Commissioner Terry at Vienna. He says the proposed new customs tariff was brought before Parliament on May 21 and, if passed, will mean an increase over the present customs duty of from \$200 to \$1,400 on automobiles and approximately \$100 on motorcycles.

He says:

When the limited buying power of the Austrian population is considered it is plain that these new duties may be considered as practically prohibitive to the importation of American automotive products.

Nevertheless, efforts are now being made to overcome the chief difficulties affecting

(Continued on page 268)

Truck Exports Rise; Those of Cars Drop

Figures for June, However, Bring
Total for Six Months Well
Above Year Ago

WASHINGTON, July 28—While exports of automobiles declined in June from the previous month and from June of last year, the total for the six months is well over the aggregate for the corresponding period a year ago, according to figures compiled by the Bureau of Foreign and Domestic Commerce. For the six months' period in 1924 total cars exported amounted to 80,291, while in the same period a year ago the total reached 64,641.

Motor truck shipments showed a slight gain this June as against June a year ago and a marked gain for the half year over the corresponding six months of 1923. During the six months of this year truck exports aggregated 15,802.

Figures for the six months' period in both car and truck shipments and for June of last year follow:

	Passenger Cars	Trucks
	1923	
June	12,387	2,131
	1924	
June	10,142	2,191
May	14,363	2,739
April	15,808	2,764
March	14,035	2,839
February	13,329	1,704
January	12,614	2,845
Total (1924) ...	80,291	15,082

Details of the shipments of automotive products are given in the table published on this page.

Stutz Fire Engine Co. Buys Milholland Plant

INDIANAPOLIS, July 28—The Stutz Fire Engine Co. of this city through Paul Ragan, an official of the company, has bought the plant of the Milholland Machine Co., one of the subsidiaries of the Dollings Co.

The plant will allow substantial ex-

pansion, and the five buildings already in existence give much more room than the fire engine company has had at its old plant.

In the sale by the receiver not only the plant was sold, but the business of the Milholland company and general and special equipment and tools were disposed of to The Gisholt Machine Co. of Milwaukee and to Michael E. Panber & Co. of Chicago. The Gisholt company took the business of the Milholland company and special equipment and inventory.

A total of \$116,000 was received by Bert McBride, receiver, which is to apply as payment on indebtedness of the defunct company. Paul Ragan paid \$46,000 for the plant for the Stutz company.

WIGGLER IN BANKRUPTCY

BUFFALO, July 28—A voluntary petition in bankruptcy has been filed by the Wiggler Corporation, manufacturer of automobile accessories, by George J. Zeis, president. The assets are listed at \$4,591 and the liabilities at \$18,536.

Exports, Imports and Reimports of the Automotive Industry for June of Current Year and Total for Twelve Months Ending June 30.

	Month of June		Twelve Months Ending June	
	1923	1924	1923	1924
EXPORTS				
Automobiles, including chassis.....	No. 14,526	Value \$10,130,183	No. 12,341	Value \$9,013,148
Electric trucks and passenger cars.....	8	15,115	.....	.....
Motor trucks and buses, except electric:				
Up to 1 ton.....	1,735	608,120	1,053	444,715
Over 1 and up to 2½ tons.....	316	387,456	454	616,739
Over 2½ tons.....	80	147,665	116	291,074
Total motor trucks and buses, except electric	2,131	1,143,241	2,191	1,532,860
PASSENGER CARS				
Passenger cars, except electric:				
Value up to \$500 inclusive.....	5,231	1,925,885	4,417	1,648,517
Value up to \$800.....	2,672	1,783,864	2,801	1,953,260
Value over \$800 and up to \$2000.....	4,198	4,469,099	2,645	3,072,061
Value over \$2000.....	226	792,979	279	800,231
Total passenger cars, except electric.....	12,387	8,971,827	10,142	7,474,069
PARTS, ETC.				
Parts, except engines and tires*.....				
Automobile unit assemblies*.....	3,060,466	511,359	490,784	79,316,512
Accessories and parts*.....	17,285,074	4,087,851	.....	18,618,812
Automobile service appliances (not elsewhere specified)*.....	187,934	92,560	566,919	2,806,675
Station and warehouse motor trucks.....	21	9,517	8	26,768,445
Trailers.....	61	27,582	18	14,187,883
Airplanes.....	5	4,500	2	125,203,670
Parts of airplanes, except engines and tires*.....	9,681	3,310	7,814	27,913,939
BICYCLES, ETC.				
Bicycles and tricycles.....	1,948	14,606	949	625,735
Motorcycles.....	1,833	418,258	908	342,982
Parts except tires*.....	292,853	154,085	221,052	4,392,221
INTERNAL COMBUSTION ENGINES				
Stationary and portable:				
Diesel and semi-Diesel.....	15	66,056	23	1,826,746
Other stationary and portable.....	3,583	571,290	1,855	1,28,093
Not over 8 H.P.....	95	89,013	262	180,818
Over 8 H.P.....	.....	.....	.....	348,498
Automobile Engines.....	444	39,745	17	299,660
Motor trucks and buses.....	3,214	393,687	1,439	1,138,320
Passenger cars.....	180	55,104	209	3,946,341
Tractors.....	10	7,060	2	1,950
Aircraft.....	819,505	337,968	870,812	523,942
Accessories*.....	.....	.....	.....	207,487
IMPORTS				
Automobiles and chassis (dutiable).....	116	123,820	69	8,670,365
Other vehicles and parts for them (dutiable).....	.....	209,771	.....	3,689,376
REIMPORTS				
Automobiles (free from duty).....	50	74,834	45	.....

* Pounds

FINANCIAL NOTES

B. F. Goodrich Co., for the first half of the year shows a net profit of \$2,755,017 compared with \$3,006,384 in the same period last year. Net sales of \$50,137,665 are reported, with expenses, etc., running to \$45,412,864. Surplus is placed at \$1,514,547 and profit and loss surplus at \$12,736,509. Included in the \$87,950,404 assets are \$3,710,550 cash, \$16,766,501 accounts and notes receivable, and \$26,919,537 inventory.

Reynolds Spring Co., including its subsidiary, the General Leather Co., reports a net income of \$101,168 in the second quarter, which, after depreciation and Federal taxes, is equivalent to 24 cents a share earned on the 387,958 shares of common of no par value. Net income in the first quarter, when the earnings of the subsidiary were not included, was \$65,038.

Maxwell Motor Corp. reports net earnings of approximately \$475,000, before taxes, for the first six months, after absorbing expenses during the first quarter of putting the Chrysler into large production. June sales of 3200 Maxwells and 3000 Chryslers are reported, while Chrysler production is being increased to 165 a day.

Studebaker Corp.'s financial statement for the second quarter shows net profits of \$4,030,010. Net sales totaled \$35,502,735, 28,152 cars being sold. Net profits before income tax were \$4,662,796. In the first six months of this year 57,587 cars were sold, net sales totaled \$71,106,226 and net profits were \$7,572,269.

Pierce-Arrow Motor Car Co., reporting for second quarter, shows net income of \$138,144 after depreciation, interest, taxes, etc. This compares with \$78,729 in the first quarter. For the first half of the year net income totaled \$216,873, equivalent to \$1.53 a share on the preferred, against \$267,911, or \$2.04 a share in the first half of the previous year.

McCord Radiator & Manufacturing Co. reports net earnings of \$507,198 on 45,000 shares of Class A stock and after all charges for the first six months. Current assets were \$1,841,000, against current liabilities of \$405,000.

Hayes Wheel Co. has declared the regular quarterly dividends of 75 cents a share on common and of 1½ per cent on preferred, both payable Sept. 15 to stock of record Aug. 30.

H. H. Franklin Manufacturing Co. has declared the regular quarterly dividend of 1½ per cent, payable Aug. 1, on Franklin preferred stock.

White Motor Co. has declared its thirty-fifth regular consecutive quarterly dividend of \$1 per share, payable Sept. 30 to stock of record Sept. 20.

New Sheldon Bus Axle Now Ready for Market

WILKES-BARRE, PA., July 29—The Sheldon Axle & Spring Co. now has ready for the market the double-reduction axle for high-speed motor coaches and motor buses manufactured by it under the Huck patents and under the personal direction of Louis C. Huck, designer of the Huck self-energizing floating cam brake and Huck axle.

The new axle permits buses to be built with a lower floor board height, it is claimed by the company, than does even

the usual design of inverted worm axle, and yet provides more road clearance than the overhead worm type. It also is said to bring the center of gravity lower and at the same time meet the demand for a low-hung bus.

Meachem Producing Gears in New Syracuse Factory

SYRACUSE, N. Y., July 30—The Meachem Gear Corp. of this city is now in production in its new factory here. The new building, a five-story brick structure, contains about five times as much floor space as the old factory and was made necessary by increased production and demand since the company resumed the manufacture of automobile gears.

Up to a short time ago the company made only industrial gears, but now has re-entered the automobile field, manufacturing drive, engine, transmission, differential and flywheel gears. The manufacture of industrial gears will be continued.

The new plant has been equipped with new machinery to meet the schedule of increased production which the company has outlined. The force of employees is to be greatly increased within a short time. The Meachems and the gear industry have been closely identified for many years, Thomas F. Meachem, father of J. F. Sabine and T. Goldsborough Meachem, officers of the present company, having been one of the pioneers in the industry.

Flint Men Organizing New Castings Company

DETROIT, July 26—Flint Malleable Castings Co. is being organized by a group of Flint men well known in the industry, to make castings particularly for the group of automotive plants located in the Flint district. The company will have a capitalization of \$500,000, and the plant as planned will have an annual capacity of 7000 tons of castings.

The men behind the organization are John M. Barringer, president; Fred J. Weiss, vice-president; Carl W. Bonbright, secretary; Edwin W. Atwood, treasurer; Charles H. Bonbright, director, and Charles A. Reynolds, director of sales.

Alden L. McMurtry Dies Following Long Illness

NEW YORK, July 28—Alden L. McMurtry, one of the founder members of the Society of Automotive Engineers, whose membership dates back to 1905, is dead at his home in Greenwich, Conn., after a long illness. He was 48 years old.

Major McMurtry was a member of the S. A. E. Standards Committee for years, specializing on headlights. Traffic control also was a hobby of his and as chief inspector of the Connecticut Motor Vehicle Department he was largely responsible for the code now in effect in that State.

Data Asked of States on Their Title Laws

A Campaign for More General Adoption of Certificate Plan May Come as Result

NEW YORK, July 30—The Motor Vehicle Conference Committee has sent a questionnaire to the Secretary of State of each of the commonwealths which have passed certificate of title laws. This step has been inspired by the National Automobile Chamber of Commerce and the American Automobile Association, both of which believe that if such a measure becomes universal throughout the country it will assist materially in destroying the market for stolen cars.

The questions asked are pertinent to the operation of the law, full information being desired in order that the Motor Vehicle Conference Committee may plan a campaign which will be made to have other States adopt a measure of this type when the various Legislatures meet next year.

New Executive Committee Created by Link-Belt Co.

CHICAGO, July 29—Changes in personnel of the Link-Belt Co. have been brought about through the acquisition of additional plants and a considerable extension of its lines and business. The chairman of the board has been made the chief executive officer of the company, and an executive committee of four created to act in an advisory capacity to the officers.

This has resulted in the election of Charles Piez as chairman of the board and chairman of the executive committee, while the other three members selected were Alfred Kauffman, who also was elected president of the company; Staunton B. Peck, senior vice-president, and Thomas B. Marston, a members of the board of directors.

Mr. Kaufmann will have general direction and supervision of operations and sales. Mr. Peck will be in charge of sales and operations in the eastern district. Arthur C. Johnson, elected second vice-president, will remain in charge of the western district, and Humphrey J. Kiely, newly elected third vice-president, continues in charge of exports and sales in the New York district.

Balloons on New Star; Four-Wheel Brakes, Too

NEW YORK, July 30—Durant Motors, Inc., has brought out a new Star Special on which four-wheel brakes, 4.95 in. balloon tires, and five 20 in. disk wheels are regular equipment. In other respects the car does not differ from the special phaeton with high pressure cords, which was announced several months ago. The price of the new model is \$745.

N. A. D. A. Planning "Sales Congresses"

Has Asked the N. A. C. C. to Bear
Half the Cost of New Merchandising Campaign

ST. LOUIS, July 28—Another nationwide merchandising campaign is planned by the National Automobile Dealers Association, which is asking the National Automobile Chamber of Commerce to stand half of the estimated expense of \$50,000 required for the work. This the Chamber will decide at the September meeting of its directors.

As outlined by General Manager C. A. Vane of the N. A. D. A., the program calls for a series of 25 "sales congresses," similar to the "district conventions" put on by the dealers unassisted in 1923. These congresses will be held in the principal automotive merchandising centers, each to last two days, with invitations extended to all automotive tradesmen within a radius of 200 miles. It is figured that such a program would reach approximately 40,000 dealers with their sales organizations, and embrace territory in which are registered 80 per cent of all the motor vehicles in the United States.

Subjects chosen for discussion by experts are management, sales and maintenance. A typical program as outlined by Mr. Vane would be as follows:

FIRST DAY

Management Problems.
Making Service Sell Automobiles.
The Retail Manager's Job.
Automotive Equipment as a Profit Builder.
Doubling the Salesman's Income.

SECOND DAY

Fundamentals of Selling.
(Full morning meeting of dealers, salesmen and sales managers in a practical discussion with sales consultants of the National Automobile Dealers Association, developing fundamental ideas of merchandising, individual selling problems and personal experiences of salesmen in sales made and lost; individual analysis for salesmen submitting problems for discussion.)

No admission will be charged to these meetings; nothing will be sold and no solicitations for membership in any organization will be permitted.

Brewer Firm to Promote New Engineering Devices

PHILADELPHIA, July 30—Robert W. A. Brewer, one of the early engineers in the motor industry in England and a resident of America since 1914, when he came here as a representative of the British Government in connection with war orders, has, in conjunction with others, formed the Engineers Development Co., with headquarters at 508 Atlantic Building, this city.

This company has been incorporated to carry out advanced engineering development work and to form a means whereby many ideas which at the pres-

ent time have no possibility of outlet can be capitalized and commercialized if they are considered to possess real merit.

One of its objects is to make it possible to bring engineering devices of merit before the industry and have them recognized in a reasonable period of time, whereas often it has required 10 years or more to accomplish this end. Mr. Brewer is president and associated with him are W. A. Brown, general manager, and E. A. Corbin, Jr., associate engineer.

INDUSTRIAL NOTES

Mitsubishi Shoji Kaisha, Ltd., Tokio, Japan, has been made exclusive agent for the Empire of Japan, Formosa, Korea, Manchuria and Shantung, for Norton Grinding Machines, manufactured by Norton Co., Worcester, Mass. Mitsubishi Shoji Kaisha, Ltd., has a New York office at 120 Broadway.

George E. LaVietes has bought from the New England Tube & Stamping Co. of West Haven, Conn., which has retired from business, the patent rights and equipment for the manufacture of Ace windshield cleaners. He will market the device through jobbers under the same trademark through the Ace Products Corp of this city.

Joseph N. Smith & Co., manufacturer of hardware for automobiles, featuring windshields, mouldings, robe rails and foot rests, hinges and similar equipment, is removing its manufacturing activities from the east to the west side of Detroit in order to secure more floor space. It has taken the former Plant 3 of the Ternstedt Manufacturing Co., at 5914 Federal Avenue, and has sold its old factory to the Standard Computing Sales Co.

Norma Co. Changes Name So It Includes "Hoffmann"

NEW YORK, July 29—The Norma Co. of America of Long Island City, N. Y., has changed its corporate name to the Norma-Hoffmann Bearings Corp., with the same management, personnel and policies as heretofore. This step is taken in order that the corporation may realize to the fullest the value of its nationally advertised trademarks, "Norma" and "Hoffmann."

The company has completed a new and modern plant on its 17 acres of property at Stamford, Conn., where it will manufacture both the Norma and Hoffmann lines. Its Norma line was introduced 12 years ago and has met the needs of manufacturers of fractional horsepower motors, small generators, vacuum cleaners, electrical utility motors, measuring and recording instruments, grinders and drills and other small tools.

Following the success of the Norma line of precision ball bearings, the company two years ago acquired the American rights in patents, trademarks and business of the Hoffmann Manufacturing Co., Ltd., of Chelmsford, England, and now is manufacturing in this country the Hoffmann heavy-duty precision roller bearing in addition to the Norma.

METAL MARKETS

Always bearing in mind that backing and filling in the commodity markets is a normal condition in presidential election years, the outlook in the metal markets has decidedly brightened. Several rolling mills, which either had been entirely closed or had been operating at the lowest possible rate, resumed production on a broader scale this week, and production in the steel industry is expanding all along the line. So far as can be learned in the New York sales departments of the leading steel producers, there has been no appreciable increase in the tonnage being placed on order books, but not only is the number of orders on the increase, there is also a tendency to order in slightly more liberal quantities.

Purchasing agents are still cautious. Sales managers, however, believe that the industry has now definitely turned the corner, and that activity will become more and more pronounced from day to day. Advances in the non-ferrous metal markets have exerted a sentimental influence upon the steel situation. Thanks to automotive buying, the hot- and cold-rolled strip market has a much more rosy complexion, 4.25c., Pittsburgh, having apparently become the general inside figure, whereas a week ago this might have been shaded by close shopping. There is not much change in the sheet situation, but the tone is obviously improved. If the leading interests' unfilled tonnage statement for July shows that the decline in the order backlog has come to a halt, the position of producers will be considerably fortified.

Much ado has been made about the Federal Trade Commission's decision in the "Pittsburgh Plus" case. Whether or not appeal is taken from it and, if it is appealed, no matter what the final verdict may be, the effect on the steel industry and on the steel market is certain to be nil. Screaming headlines seeking to make the man in the street believe that the steel "barons" had been spanked by the Federal Trade Commission do not alter the fact that the whole affair is a tempest in a teapot. No one will be hurt if for this custom of the trade another has to be substituted. Competition in recent years has frequently suspended the custom anyway, and ever so often there is a diversity in Chicago, Pittsburgh and Eastern Pennsylvania prices. Anyway, if the Federal Trade Commission should issue a ukase tomorrow that plate glass must be sold at net prices instead of at a discount from the present base price list, such an edict would neither cheapen nor enhance the price of glass. It is no different with steel.

Pig Iron—The market has turned slow with No. 2 foundry holding nominally at \$19, Pittsburgh.

Aluminum—An anomalous situation is noted in the aluminum market these days. Germany, according to latest advices, is consuming steadily increasing tonnages and selling prices for home consumption are \$23 per ton above the export quotation. Still there is a considerable export trade in the metal. The other day the SS. "Topdalsfjord" brought from Norway 5405 aluminum ingots to the American producer and 6745 to the leading New York importer. At about the same time the SS. "Tsuyama Maru" steamed out of the Port of New York with 4181 ingots in her hold for Japan. The market is quiet and firm.

Copper—With the red metal up to 13c., advances for copper and brass products have been promulgated.

Calendar

SHOWS

- Oct. 21-27—Transportation Show, Motor Truck Industries, Inc., American Exposition Palace, Chicago.
- Nov. 9-15—New York, Annual Automobile Salon, Commodore Hotel.
- Jan. 3-10—New York, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Bronx Armory.
- Jan. 24-31—Chicago, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.
- Jan. 25-31—Chicago, Annual Automobile Salon.

FOREIGN SHOWS

- Aug. 23-Sept. 2—Bratislava, Slovakia, International Danube Fair.
- Aug. 23-Sept. 6—Toronto, Ont., National Automobile Show in conjunction with the

Canadian National Exhibition under the sanction of the Canadian Automotive Equipment Association and the Automotive Industries of Canada.

- September—Vienna, Austria, Vienna International Fair.
- Sept. 13—Sao Paulo, Brazil, Annual Automobile Show.
- Sept. 21-28—Prague, Czechoslovakia, Prague Autumn Fair.
- Oct. 2-5—Dantzig, Second International Dantzig Fair, automobiles and allied equipment.
- Oct. 2-12—Paris, passenger cars, motor cycles, bicycles and accessories, Grand Palais.
- Oct. 17-25—London, Annual Passenger Car Show, Olympia.
- Oct. 22-31—Paris, motor trucks, stationary engines, garage tools and machine tools, Grand Palais.
- Dec. 1-13—Montevideo, Uruguay—Second Annual Motor Show, under the auspices of the Centro Automovilista del Uruguay, held in

buildings of the Asociacion Rural del Uruguay.

RACES

- Aug. 3—Lyons, France, European Grand Prix.
- Sept. 1—Altoona.
- Sept. 1—Syracuse.
- Sept. 7—Monza Track, near Milan, Italy, Italian Grand Prix.
- Oct. 2-4—Dayton, Ohio, Fifth Airplane Race for the Pulitzer Trophy.
- Oct. 4—Fresno.
- Oct. 19—Kansas City.
- Nov. 24—Los Angeles.

CONVENTIONS

- Sept. 8-11—White Sulphur Springs, W. Va., Annual Meeting of the Automotive Electric Association, Greenbrier Hotel.
- Sept. 19-20—Niagara Falls, N. Y., National Battery Manufacturers Association.
- Sept. 22-26—Boston, Sixth Convention and International Steel Exposition of the

American Society for Steel Treating.

- Oct. 16-18—Briarcliff Manor, N. Y., Semi-Annual Meeting of the American Gear Manufacturers Association, Briarcliff Lodge.
- Jan. 5—New York, Convention under the auspices of the National Automobile Dealers Association, Hotel Commodore.
- Jan. 26-29—Chicago, Eighth Annual Convention of the National Automobile Dealers Association, Hotel LaSalle.

S. A. E. MEETINGS

- September—New York City, S. A. E. Automotive Transportation Meeting.
- Oct. 21-24—S. A. E. Production Meeting, Detroit.
- Nov. 18-19—Joint Service Meeting of the S. A. E. with the N. A. C. C. Cleveland.
- Oct. 26—Aeronautical Meeting at Dayton at the time of the Pulitzer Races.
- January—S. A. E. Annual Meeting, Detroit.

Credit Chief Factor in Sales in Poland

(Continued from page 264)

American importation, which are lack of proper finances, and the length of time required for shipments from the United States to Austria.

The future of the Austrian market, as far as America is concerned, depends largely upon a practical solution of these difficulties.

Influenced by favorable weather conditions, sales in China have increased during the last few weeks and importers of American cars, according to Assistant Trade Commissioner Osborn S. Watson at Shanghai, were able to dispose of them almost as quickly as they were received. Imports have fallen off about 20 per cent, due to exchange fluctuations at the end of 1923.

There is no activity in the truck market and imports of motorcycles have dropped below the figures of 1923. It is thought that the sales for the second quarter will exceed those of the first three months, due to the usual seasonal increase in automobiles in China during the summer months, while the warm weather will result in the freer use of cars.

British South Africa automotive trade improved considerably during the year 1923 and dealers in motor vehicles consider the future of the business very promising, Vice Consul J. L. Pinkerton at Durban, Natal, S. A., cables.

American passenger cars dominate the market, with sales made largely of low-priced cars. The British obtain the larger share of the truck business. In 1923 the United States exported to British South Africa 4853 passenger cars and 103 trucks.

The passenger car market in the Philippine Islands continued to show improvement during the first three months of

1924, Assistant Trade Commissioner Goodhue at Manila reports. In 1923 the United States exported to the Islands 11,443 passenger cars and 346 trucks.

The dispatch explains the improvement was largely seasonal, since these months of the year are normally the best business period of the automotive trade. The truck situation is also gradually improving; stocks are being reduced, and used trucks which formerly lay idle have been brought into service. The demand, as usual, is largely for light model trucks from 1 to 1½ tons.

Trade Commissioner Osborne at Rome reports that all indications point to continued increase in the activity of the Italian automotive market. He says imports of cars and trucks during the first quarter totaled 257, against 133 for the corresponding period of 1923, and showed a decided increase in the number of French cars entered.

During the first quarter of 1923 Italian exports of automotive units were 2876, while they totaled 3798 for January, February and March of this year.

Financial difficulties and the unfavorable rate of exchange have practically stopped imports of automobiles into Norway, Consul S. Bertrand Jacobson at Christiania advises. The import duty on motor vehicles was recently increased to 33 1/3 per cent ad valorem, and it is unofficially stated that in taking this step the Norwegian Government hoped to curtail the expenditure of money for luxuries. The market is at present overstocked, and dealers are obliged to hold their stocks.

In Mexico the automotive trade during the second quarter showed a decided improvement over the first three months. Commercial Attaché Alexander V Dye at Mexico City says increased sales were made in the low and medium priced passenger cars.

Upham Made Director of Highway Research

WASHINGTON, July 28—Charles M. Upham, State highway engineer of North Carolina, has been appointed director of the Advisory Board on Highway Research of the National Research Council. He succeeds Dr. W. K. Hatt who resigned in order to resume his work at Purdue University.

The present board intends to extend its activities so that the results of highway research may be practically applied by the States and counties carrying on programs of highway construction and maintenance and by others interested in highways.

The organization has been extended so that each State highway department may have a representative on the board who will serve as a point of contact between it and the State. It is also planned to have a similar representation from universities engaged in highway research.

A. J. Brosseau, president of Mack Trucks, Inc., and proponent of the declaration before Secretary Hoover's Conference on Street and Highway Safety that reckless automobile drivers be deprived of both car and license, represented the National Automobile Chamber of Commerce at the meeting.

MICHIGAN SALES IMPROVE

DETROIT, July 26—Registration of new cars in Michigan has shown a steady increase in the last ten days, reflecting much improved sales conditions throughout the State. Issuance of licenses had been averaging about 600 daily for some time up to the start of this ten-day period, in which time they have dropped to 1000 daily and promise still further increases. The licensing of 1000 new cars in one day has not occurred for a considerable period.